

**Museums at a Distance:
Distance Education in the Service
of Rural K-12 Educators**

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ZÉLIE LEWIS

Program in Museum Studies

Graduate School of Arts and Science

New York University

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Abstract

Over the last decade, museums have reevaluated the ways in which they serve the public, particularly K-12 audiences. As funding concerns, travel distance, and school requirements prevent many students from visiting museums in person, America's 8.9 million rural students are disproportionately impacted, and educators are left to fill the gap with whatever resources they can find. Museums have begun serving rural educators through distance education, a technique that uses technology as a medium for connecting museum instructors and learners. Dozens of museums across the U.S. currently offer distance education resources. These offerings fall into three main categories: teacher resources, including curriculum packs and professional development, interactive modules and online courses, and alternative field trips. Despite the increasing popularity of distance education programs, little research has been done to understand the reality of these programs for end users, especially rural K-12 educators. This thesis uses 14 interviews with rural educators, museum staff, and museum consultants. Seven interviews with educators from two rural school districts enable a better understanding of the needs of rural audiences. Seven interviews conducted with museum staff at the National World War II Museum in New Orleans, the North Carolina Museum of Art in Raleigh, and the American Museum of Natural History in New York, as well as a museum consultant, explore the design process of distance education resources. At the time of writing, the need for distance education became critical as nearly 55.1 million school children across the U.S. shifted to online learning due to an unprecedented health event in 2020 that mandated nationwide school closures.¹ This thesis culminates in a list of suggestions to help museums better serve rural communities – and the country as a whole – as they develop and implement distance education resources.

¹ Education Week, "Map: Coronavirus and School Closures," March 6, 2020; updated March 29, 2020. Accessed March 30, 2020, <https://www.edweek.org/ew/section/multimedia/map-coronavirus-and-school-closures.html>.

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Introduction

When was the first time you visited a museum? Do you remember how old you were or who took you to the museum that day? One of my first museum memories is from the Smithsonian Museum of Natural History in Washington, D.C. while on a fifth grade Science Club field trip. I was 11, and my father and I trekked around the nation's capital visiting as many of the famous sites as we could. The trip was sponsored and organized by my rural elementary school and paid for by my parents, and for many students in our group, the trip marked their first visit outside New York State.

If you grew up in the United States, chances are your first museum visit mirrors mine and was facilitated by your school. The fact that a school facilitated a museum visit is unsurprising, as museums across the U.S. operate a wide variety of educational initiatives to attract K-12 teachers and students. According to a report by the American Alliance of Museums (AAM), museums spend over \$2 billion a year and earmark approximately 75% of their education department budgets for work with school groups.² Museum educators have worked for generations to bring students into museum spaces to engage with educators, explore galleries, or participate in hands-on activities related to the collection. In 2009, an AAM report showed that museums saw over 55 million school group visits each year and provided over 18 million hours of instruction to students and teachers.³ A study completed by Jay P. Greene, Brian Kisida, and Daniel H. Bowen in 2014 shows that museum field trips provide a number of positive social and

² Elizabeth E. Merritt and Philip M. Katz, eds., *Museum Financial Information 2009* (Washington, D.C.: American Alliance of Museums, 2009), 41-51.; American Alliance of Museums, "Museums and P-12 Education," accessed September 26, 2019, <http://www2.aam-us.org/about-us/what-we-do/museums-k12>.

³ "Building the Future of Education: Museums and the Learning Ecosystem," Center for the Future of Museums (Washington, D.C.: American Alliance of Museums, 2014), 9-13.

intellectual experiences for students.⁴ Among these benefits are increases in school assessment scores, factual recall, levels of tolerance, critical thinking skills, and interest in museums more broadly. Students from a variety of school types and settings showed growth in social and intellectual experiences, with students from rural and high poverty schools showing even higher rates of growth.⁵

Despite demonstrated benefits, the rate of museum field trips decreased following the 2008 recession. In a 2015 report on survey responses from school administrators conducted by the American Association of School Administrators, only 12% of the 528 administrators surveyed reported bringing their field trip numbers back to the pre-2008 rate.⁶ Funding concerns, travel distance, and school expectations are often cited as the main challenges preventing students from accessing field trip opportunities, particularly for those from rural communities.⁷ Against a dire backdrop of decreased field trips and growing funding concerns, museum educators found new methods to connect with school groups. Like many other developments in the museum field, the diversification of connections to school groups came mostly out of necessity. With a large portion of museum visitors less likely to visit the museum in person, institutions needed to innovate. As a result, more museums have begun using distance education techniques to provide K-12 students with access to museum staff, collections, and experiences.

⁴ Jay P. Greene, Brian Kisida, and Daniel H. Bowen, “The Educational Value of Field Trips,” *Education Next*, Winter 2014, Vol. 14, No. 1. <https://www.educationnext.org/the-educational-value-of-field-trips/>, accessed September 12, 2019.

⁵ Greene, Kisida, and Bowen, “The Educational Value of Field Trips.”; Richard V. Reeves and Edward Rodrigue, “Fewer field trips mean some students miss more than a day at the museum,” *The Brookings Institution*, June 8, 2016. accessed November 1, 2019, <https://www.brookings.edu/blog/social-mobility-memos/2016/06/08/fewer-field-trips-mean-some-students-miss-more-than-a-day-at-the-museum/>.

⁶ Reeves and Rodrigue, 2016.; Noelle M. Ellerson and Daniel A. Domenech, “Weathering the Storm: How the Economic Recession Continues to Impact School Districts,” *American Association of School Administrators*, March 2012, https://www.aasa.org/uploadedFiles/Policy_and_Advocacy/files/Weathering_the_Storm_Mar_2012_FINAL.pdf, 9-16.

⁷ Greene, Kisida, and Bowen, “The Educational Value of Field Trips.”

As museums improve at designing and implementing distance education programs, though, it is important to examine the extent to which these programs meet the needs of the end-users and to ensure user input is integrated into the design process. The incorporation of end-user perspectives is particularly relevant when creating programs for low-access audiences that are most disadvantaged when it comes to accessing museum resources, specifically rural K-12 students and teachers.

Distance Education

To assess the value of a concept, it is important to first define that concept clearly. Due to the diversity of the field, it can be hard to create one all-inclusive definition for distance education (DE). The definition of DE used to frame my research comes from a 2013 report written by researchers Greg W. Welch, PhD, Leslie R. Hawley, PhD, and Carina McCormick from the University of Nebraska-Lincoln and published by the Crystal Bridges Museum of American Art. According to the researchers, DE involves “...instruction that is provided through a technological medium allowing communication to take place between teacher and student at different locations.”⁸ Depending on the industry, discipline, museum, and department, DE is synonymous with a variety of terms, including interactive virtual learning, distance learning, online education, interactive videoconferencing, multipoint connections, and virtual field trips. In addition to its many different names, there are two types of DE: asynchronous and synchronous. Asynchronous DE allows learners to dictate the pace of engagement and is most often self-

⁸ Greg W. Welch, Leslie R. Hawley, and Carina McCormick, *Bridging the Gap: Expanding Access to the Visual Arts through Distance Technology*, (Bentonville, Arkansas: Crystal Bridges Museum of American Art, 2013), 6, accessed September 14, 2019, <http://learn.crystalbridges.edc.org/sites/learn.crystalbridges.edc.org/files/Distance-Learning-Report.pdf>.

directed via web-based platforms. Synchronous DE, in contrast, uses “video-conferencing hardware or cloud-based applications” to support real-time engagement.⁹

The diversity of DE nomenclature and form illustrate the different iterations the field has experienced throughout its development. Marked by differences in technology and accessibility, there have been three main generations of DE thus far. Scholars, including Welch, Hawley, and McCormick, argue that the first wave of DE began at the end of the nineteenth century as a result of the expanding industrial society and the increased access to education that came through social democratization.¹⁰ Known as “correspondence study,” the first wave of DE relied on the use of more widely accessible printed and mailed materials that allowed students to learn and study from home. As an asynchronous form of DE, this format was offered at varying levels of formal education and was first used informally by societies for women and by educational institutions in England before the practice was adopted in the United States. These early forms of DE corresponded with the development of the postal service, making it easier to share resources over greater distances.¹¹ Museums quickly adopted the use of DE in the early twentieth century with the distribution of “...portable museum exhibits, stereographs, slides, films, study prints, charts, and other instructional materials...”¹² The end of the first wave came with WWI and WWII and brought about the adoption of DE principles by military organizations. Assisted by the technological advances of the day, soldiers received training, updates, and other correspondence via electronic and radio transmission.¹³

⁹ Kasey Gaylord-Opalewski and Lynda O’Leary, “Defining Interactive Virtual Learning in Museum Education: A Shared Perspective,” *Journal of Museum Education*, Volume 44, Number 3 (2019), 232.

¹⁰ Welch, Hawley, and McCormick, 7.

¹¹ Hope Kentnor, “Distance Education and the Evolution of Online Learning in the United States,” *Curriculum and Teaching Dialogue*, Vol. 17, Nos. 1 and 2 (2015), 23-24.

¹² Paul Saettler, *A History of Instructional Technology*, (New York: McGraw-Hill, 1968), 17, cited in Anne Kraybill, “Going the Distance: Online Learning and the Museum,” *Journal of Museum Education*, Volume 40, Number 2 (2015), 97.

¹³ Kraybill, “Going the Distance: Online Learning and the Museum,” 97.

Approximately a decade later, DE evolved again with the development of early forms of digital technology and media in the 1950s and 1960s, marking the end of the first generation of DE and the beginning of the second.¹⁴ As these early forms of digital technology expanded, audio and video cassettes, television, and early computers became the main forms of presenting content to the public. For example, New York University and CBS Broadcasting offered a television-based program called *Sunrise Semester* that originally offered academic credit to the participating audience.¹⁵ In 1969, the newly established Open University of the United Kingdom became the “hallmark of the second generation of distance education” by becoming the first university to present all of its educational content using DE practices.¹⁶ Lasting until the 1980s, the second generation of DE continued to rely on asynchronous delivery methods despite the improvements in the field of digital technologies.

Distance education’s third generation began in the 1990s with the rapid development of web-based technology and a shift to synchronous delivery. The first major synchronous delivery project was undertaken by Bell Laboratories (a company descended from the work of Alexander Graham Bell) in 1994 and was integrated into cultural organizations and K-12 education settings beginning in 1995.¹⁷ One of the first museums to get involved with this new program was the Philadelphia Museum of Art under the direction of Dr. Danielle Rice, the Curator of Education at the time. Through its partnership with scientists from Bell Laboratories, the museum began using Integrated Services Digital Network (ISDN) lines to connect with K-12 schools.

¹⁴ Welch, Hawley, and McCormick, 7.

¹⁵ Welch, Hawley, and McCormick, 7.; American Radio History, “WBC Buys ‘Sunrise Semester’.” accessed November 2, 2019, <https://americanradiohistory.com/hd2/IDX-Business/Magazines/Archive-BC-IDX/58-OCR/1958-04-14-BC-OCR-Page-0093.pdf>.

¹⁶ Welch, Hawley, and McCormick, 7.; The Open University, “About,” accessed November 2, 2019, <http://www.open.ac.uk/about/main/>.

¹⁷ Welch, Hawley, and McCormick, 8.; Gaylord-Opalewski and O’Leary, 231.; Lynda O’Leary, “Insights on a Museum’s Distance Learning Program,” *Journal of Museum Education*, Volume 36, Number 3, 241.

In her overview of DE in museums, museum scholar Lynda O’Leary defines ISDN as “a digital telephone network system that simultaneously transmits voice and video data.”¹⁸ The goal of the museum-industry partnership was to provide schoolchildren access to museum staff and collections via live and interactive lessons that could be scheduled at the school’s convenience – a goal that would go on to become the core of many DE programs. Museum education kept pace with the developments in digital technologies and DE over the next 15 years with countless museums incorporating DE into their programs and offerings. Notable experiments with online teaching and learning during this time include a 2007 online teacher professional development session at the Metropolitan Museum of Art, the creation of “virtual fossil digs” at The Field Museum of Chicago in 2008, and an online learning program called Smithsonian Quests that was launched in 2012 by the Smithsonian Center for Learning and Digital Access.¹⁹

Distance education in museums is now an increasingly common offering. While some museums still offer modern versions of “correspondence study” through mobile museum buses or museum exhibitions in a box, the ease and affordability of engaging with diverse and geographically distant audiences as allowed by digital technologies has impacted the direction of DE development. As a result, DE is now increasingly web-based. The common methods by which DE resources are delivered are listed below:

- Institutional Websites – Museum websites are increasingly seen as an educational resource and an important way to engage visitors digitally. As of 2006, museums had already engaged more than 500 million visitors online.²⁰ According to a 2009 survey of

¹⁸ O’Leary, 241.

¹⁹ Herminia Din, “Pedagogy and Practice in Museum Online Learning,” *Journal of Museum Education*, Volume 40, Number 2 (2015), 104.; Lynn-Steven Engelke, “Engaging Students Online with the Smithsonian: A Case Study,” *Journal of Museum Education*, Volume 40, Number 2 (2015), 131.

²⁰ Welch, Hawley, and McCormick, 10.

art museums completed by Kris Wetterlund and Scott Sayre, these institutions provide educational resources via their websites in a variety of formats, including:

- Activities and lessons (present on 64% of websites)
- Online collections (54%)
- Interactive games or activities (23%)
- Online exhibits (23%)

In gathering these numbers, this survey also highlights the discrepancies between large and small museums in providing DE resources, with the largest museums reporting more resources available online than the smallest.²¹

- Massive Open Online Courses (MOOCs) – As a type of learning management system, MOOCs were originally designed in 2011 by university professors and adopted in higher education settings.²² MOOCs are a type of online learning platform that allows many “students” (sometimes thousands at a time) to enroll in courses via the web.²³ Museums began adapting the MOOC structure to offer their own online web-based courses. While the Museum of Modern Art in New York had been offering small scale online classes for a few years, in 2014 the museum was invited to offer its first MOOC for teacher professional development via the Coursera platform. In contrast to the 45-student classes from its earliest foray into online learning, MoMA saw more than 17,000 registrants for its first MOOC.²⁴ While these types of courses have inspired both positive and negative

²¹ Kris Wetterlund and Scott Sayre, “2009 Art Museum Education Programs Survey” (Museum Ed, 2009), 18-19, accessed September 26, 2019, <https://www.museum-ed.org/2009-art-museum-education-programs-survey-report/>.

²² Jeffrey R. Young, “MOOCs Are No Longer Massive. And They Serve Different Audiences Than First Imagined.” EdSurge, August 21, 2018, accessed March 21, 2020, <https://www.edsurge.com/news/2018-08-21-moocs-are-no-longer-massive-and-they-serve-different-audiences-than-first-imagined.>; Lisa Mazzola, “MOOCs and Museums: Not Such Strange Bedfellows,” *Journal of Museum Education*, Volume 40, Number 2 (2015), 159.

²³ Mazzola, 159.; Din, 107.

²⁴ Mazzola, 159-161.

feedback from users and creators, museums with the capacity to host a MOOC have the potential to reach hundreds of thousands of people with just a few courses.

- Videoconferencing – Frequently the most synchronous DE resource, videoconferencing allows museum presenters and audiences to engage with one another via video and audio feeds. Videoconferences are sometimes referred to as “virtual field trips,” and the degree to which these sessions move students through the museum space is often dictated by presenter comfort and the technological capacity of an institution. As access to higher quality cameras and audio systems improved, the number of videoconferences reported by museums increased. One such example is the increase of sessions at the Smithsonian’s National Museum of African Art from 800 in 2011-2012 to 1,600 in 2013.²⁵

Museums use multiple methods of delivering DE resources at the same time to serve a variety of audiences, each with unique needs and modes of accessing resources. According to museum educators Kasey Gaylord-Opalewski and Lynda O’Leary, though, data collected by the Center for Interactive Learning and Collaboration (CILC) show that the largest and most common audience for DE resources and initiatives are K-12 teachers and students.²⁶ In fact, 73% of the audience utilizing DE programs are from the K-12 setting.²⁷ As distance education has been more widely integrated into the K-12 educational setting, museums are finding more avenues with which to engage students and teachers. To illustrate the extent to which DE has become a common part of the K-12 educational experience, more than 200,000 students were enrolled in online schools as early as 2009-2010. There were another 1.8 million students hailing from 53% of the nation’s public school districts enrolled in supplementary DE courses that same

²⁵ Welch, Hawley, and McCormick, 10.

²⁶ Kasey Gaylord-Opalewski and Lynda O’Leary, “Defining Interactive Virtual Learning in Museum Education: A Shared Perspective,” *Journal of Museum Education*, Volume 44, Number 3 (2019), 235-237.

²⁷ Gaylord-Opalewski and O’Leary, 236.

year.²⁸ As of the 2013-2014 academic year, 25 states ran virtual public schools that relied on DE for all aspects of the school experience. In addition, while homeschooling is outside the scope of this paper, data from the National Home Education Research Institute shows that there were approximately 2.3 million homeschool students in the US in 2016 – many of whom rely on DE resources for content – and the number is continuing to grow at a rate of 2-8% annually.²⁹

As with any project or technology, there are benefits and challenges that stem from distance education more broadly and from its implementation in museums specifically. Among some of the most commonly cited benefits are:

- Increasing the size of the museum audience – As museum curator and educator Kristen Erickson explains in her article on using web-based “portals” to foster connections to a broader audience, “large segments of American and global populations are excluded from [the museum] experience due to ticket prices, geographic distance, or unfamiliarity with the procedures of museums.”³⁰
- Direct access to and communication with visitors and learners
- Decreased education programming costs at the museum’s physical site
- Greater ease of adapting evergreen or core materials and repurposing underutilized content
- Increased revenue generation³¹

Among some of the most commonly cited challenges are:

²⁸ Kraybill, 98-99.; Naomi Coquillon and James Staples, “Webcasting for Secondary Students: Notes from the Field,” *Journal of Museum Education*, Volume 40, Number 2 (2015), 111.

²⁹ Brian D. Ray, “Research Facts on Homeschooling,” *National Home Education Research Institute*, January 7, 2019, accessed November 16, 2019, <https://www.nheri.org/research-facts-on-homeschooling/>.

³⁰ Kristen Erickson, “Using Portals to Foster Global Connectivity in the 21st-Century Museum,” *Journal of Museum Education*, Volume 44, Number 3 (2019), 271.

³¹ Din, 103.; William Crow and Herminia Din, “The Educational and Economic Value of Online Learning for Museums,” *Journal of Museum Education*, Volume 35, Number 2 (2010), 162.

- The time and expertise required from museum staff to design and maintain DE
- Finding the right platform or environment for the museum
- Training staff to be comfortable with technology
- Pressures to conform to K-12 school requirements such as Common Core State Standards, standardized tests, and 21st-Century Skills³²

While much of the literature published on DE mentions the audiences that use DE resources, research in the field is primarily focused on the needs, justifications, and experiences of the museum in designing, implementing, and evaluating DE. As a result, this paper is centered on exploring the end-user experience and understanding how taking user feedback into account can help museums design and implement better, more effective DE resources thus shifting the focus from the museum to the audience.

The Rural Dilemma

Before I discuss the particular challenges that rural K-12 audiences face, it is important to define what “rural” means. According to the National Center for Education Statistics (NCES), the US school system is broken down into locale types that classify school districts according to their proximity to an urban center. The NCES school locale system has four classifications: city, suburban, town, and rural. Each of these classifications is broken into three subcategories as seen in Figure 1. Rural communities are those located at least 2.5 miles from an urban cluster, or a population of at least 2,500 people.³³ According to these classifications, 72% of the US landmass is rural. As a result, 53% of US school districts are rural and enroll approximately 8.9 million

³² Engelke, 135.; Crow and Dina, 164-170.

³³ United States Census Bureau, “Urban and Rural,” August 30, 2018. accessed November 23, 2019, <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html>.

students annually.³⁴ While 8.9 million students only accounts for roughly 20% of the school-aged population in the US, rural school districts and students often face uniquely challenging circumstances that merit special attention. Figure 2 illustrates the percentage of rural schools in each US state, illustrating just how much of the U.S. is rural.

Locale	Definition
City	
Large	Territory inside an urbanized area and inside a principal city with population of 250,000 or more
Midsize	Territory inside an urbanized area and inside a principal city with population less than 250,000 and greater than or equal to 100,000
Small	Territory inside an urbanized area and inside a principal city with population less than 100,000
Suburb	
Large	Territory outside a principal city and inside an urbanized area with population of 250,000 or more
Midsize	Territory outside a principal city and inside an urbanized area with population less than 250,000 and greater than or equal to 100,000
Small	Territory outside a principal city and inside an urbanized area with population less than 100,000
Town	
Fringe	Territory inside an urban cluster that is less than or equal to 10 miles from an urbanized area
Distant	Territory inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area
Remote	Territory inside an urban cluster that is more than 35 miles from an urbanized area
Rural	
Fringe	Census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster
Distant	Census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster
Remote	Census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster

SOURCE: Office of Management and Budget (2000). Standards for Defining Metropolitan and Micropolitan Statistical Areas; Notice. Federal Register (65) No. 249.

Figure 1

Source: Office of Management and Budget (2000). Standards for Defining Metropolitan and Micropolitan Statistical Areas; Notice. Federal Register (65) No. 249. Obtained from National Center for Education Statistics “Rural Education in America: Definitions.”

³⁴ “Leveling the Playing Field for Rural Students,” The School Superintendents Association and the Rural School and Community Trust, November 2017, 1-3, accessed October 29, 2019, https://www.aasa.org/uploadedFiles/Policy_and_Advocacy/Resources/AASA_Rural_Equity_Report_FINAL.pdf.

Percent Rural Schools

The number of public schools located in places classified as rural by the U.S. Census Bureau, expressed as a percentage of all public schools in the state.

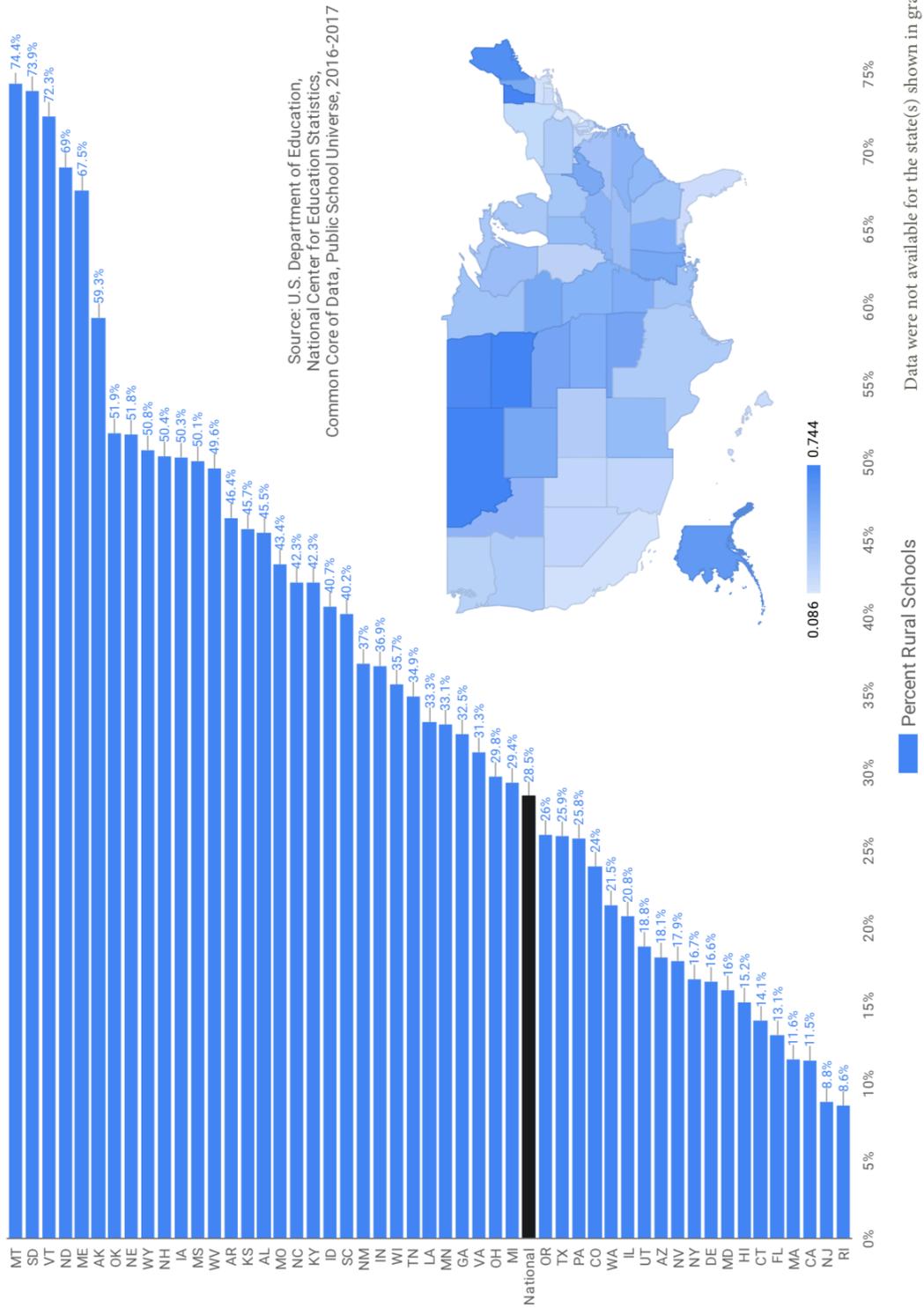


Figure 2

Source: Daniel Showalter, Sara L. Hartman, Jerry Johnson, and Bob Klein, “Why Rural Matters 2018-2019: The Time is Now,” The Rural School and Community Trust, November 2019, 69.

To begin with, rural districts struggle to attract qualified and/or specialized teachers due to “lower salaries, geographic and social isolation...lack of adequate housing...[and] the need to teach multiple subjects...” when compared to suburban or urban schools.³⁵ In addition, rural districts receive on average 17% of state education funds even though these districts experience greater costs.³⁶ In a series of reports published by the American Association of Schools Administrators, district superintendents highlighted the ways in which districts were suffering financially in the wake of the 2008 recession. The 2012 report, with data from 528 administrators from 48 states and 69.7% of results from rural districts, reflected that 30.1% of districts eliminated field trips in 2010-2011 with 29.5% more doing so in 2011-2012. Nearly 25% reduced the number and type of elective courses the district requires for graduation. In addition, 37.1% of districts deferred the purchase of any technology in 2010-2011 with 45.6% more doing so in 2011-2012.³⁷ The 2015 follow-up report, with data from 165 administrators from 37 states and 72% of results from rural districts, showed that another 10% eliminated field trips in 2015-2016, 9% reduced elective courses, and 16% deferred technology purchases.³⁸ Unfortunately, as the report authors state:

...from the availability of extracurricular activities and access to current technology in the classroom to providing adequate supplies, transportation or even summer school, there is little question that the lack of any of these resources — or a district’s diminished capacity to provide these materials and programs — will negatively impact student achievement and the success of children, and further magnify the long-term impact of the economic recession. (Ellerson and Domenech, *Education Cuts Have Yet to Heal*, 6.)

³⁵ Welch, Hawley, and McCormick, 23.

³⁶ “Leveling the Playing Field for Rural Students,” 2.

³⁷ Ellerson and Domenech, “Weathering the Storm: How the Economic Recession Continues to Impact School Districts,” 9-16.

³⁸ Noelle M. Ellerson and Daniel A. Domenech, “Education Cuts Have Yet to Heal: How the Economic Recession Continues To Impact Our Nation’s Schools,” American Association of School Administrators, December 2015, https://aasa.org/uploadedFiles/Policy_and_Advocacy/Resources/EducationCutsDontHeal_121515.pdf, 6-11.

Looking at the relationship between rural school districts and museums, it is important to remember that only 26% of museums in the US are considered “rural museums.”³⁹ According to the 2013 Crystal Bridges report on the status of distance education in museums, “two of the strongest barriers to both physical and virtual access to museums for rural students are the distance between rural locales and museums and access to high-speed broadband technology.”⁴⁰ While close to 100% of US schools have basic access to the internet, inequality of access and quality exists due to population density, poverty levels, and the terrain in which the school is located. Students at the schools with internet might not have internet at home, as well, as only 63% of people who live rural communities have access to basic broadband service and only 15% have access to high-speed internet.⁴¹ The Federal Communications Commission’s (FCC) Connect America Fund Phase II represents a federally funded effort to close the “digital divide” between urban and rural communities by awarding contracts that will “expand rural broadband service in unserved areas of 45 states.”⁴² This effort is expected to take ten years to complete, however, so there will still be a lag in the number of rural households who can access basic internet. Unfortunately, until the companies and governments responsible for providing adequate internet access to rural communities see it as the equitable and fiscally stimulating mission that it is, the digital divide will continue.

Despite these differences in internet access, the rate at which the internet is used for distance education purposes is much higher in rural school districts than in urban and suburban

³⁹ American Alliance of Museums, “Museum Facts & Data,” accessed October 15, 2019, https://www.aam-us.org/programs/about-museums/museum-facts-data/#_edn21.

⁴⁰ Welch, Hawley, and McCormick, 14.

⁴¹ Andrew Perrin, “Digital gap between rural and nonrural America persists,” Pew Research Center, May 31, 2019, accessed February 20, 2020, <https://www.pewresearch.org/fact-tank/2019/05/31/digital-gap-between-rural-and-nonrural-america-persists/>.

⁴² Federal Communications Commission, “Connect America Fund auction to expand broadband to over 700,000 rural homes and businesses,” FCC News, August 28, 2018, accessed April 7, 2020, <https://docs.fcc.gov/public/attachments/DOC-353840A1.pdf>.

districts.⁴³ As rural districts continue to struggle with access to museums for their students, it is imperative that museum staff think critically about the role of DE within the institution. DE has shown itself to be a great tool for access for communities facing challenges, even with the technological divide – but it is time that the museum and DE fields reflect on how well they are serving the needs of the end-user, in this case rural K-12 audiences.

In the following chapters I will analyze three types of distance education resources and how each type has specific strengths for engaging rural K-12 educators. The three types of DE resources are as follows:

- Teacher Resources
 - Online professional development materials
 - Curriculum packs
- Interactive Modules and Online Courses
- Alternative Field Trips
 - Virtual field trips
 - Virtual reality field trips
 - Electronic field trips
 - Skype in the Classroom

I will ground my analysis of each type of DE resource in an exploration of three selected museum case studies: the American Museum of Natural History (AMNH) in New York, NY, the North Carolina Museum of Art (NCMA) in Raleigh, NC, and the National World War II Museum (NWWII Museum) in New Orleans, LA. Each of these case studies has a unique history of DE in the institution and continues to offer a robust DE program in 2020. Woven throughout these case

⁴³ Welch, Hawley, and McCormick, 28-31.

studies are the voices of rural K-12 educators from Campbell, New York and Sanford, North Carolina as they speak about their needs and experiences regarding DE resources. After a brief profile on each museum case study, chapter one will examine the teacher resources offered via DE at AMNH and the NWWII Museum. Chapter two will examine the interactive modules and online courses offered at AMNH and NCMA, and chapter three will examine the assortment of alternative field trips offered at NCMA and the NWWII Museum. After exploring the strengths and weaknesses of each type of DE resource in relation to the needs of the interviewed schoolteachers, I provide a list of suggestions for museums to consider when designing and implementing distance education to best serve rural K-12 educators and in turn other low-access communities.

Chapter One: Museum Case Study Profiles

American Museum of Natural History

As one of the world's premiere natural history museums, the American Museum of Natural History in New York, New York is home to 32 million specimens and cultural artifacts.⁴⁴ Current president Ellen V. Futter leads the museum in its mission to “discover, interpret, and disseminate information about human cultures, the natural world, and the universe through a wide-ranging program of scientific research, education, and exhibition.”⁴⁵ The museum was founded in 1869 by American naturalist Albert Smith Bickmore with the support of several New York businessmen and politicians, including J. Pierpont Morgan and Theodore Roosevelt, Sr.⁴⁶ While AMNH's original home was the Central Park Arsenal on Manhattan's east side, the museum's official home was built at its current site on Central Park West in 1877. Over the course of its long history, the institution has employed some of the world's foremost scientists and leaders, including anthropologists Franz Boas and Margaret Mead, naturalist Roy Chapman Andrews, and biologist and taxidermist Carl Akeley.⁴⁷

Now, 150 years later, AMNH continues its commitment to teaching the public about its areas of focus by offering a diverse array of educational offerings. Beginning with young audiences, AMNH hosts numerous camps, classes and events for children and their families. Each program is designed to engage children and their families in interactive and immersive experiences that encourage the exploration of a variety of scientific disciplines. AMNH also

⁴⁴ American Museum of Natural History, “Collections,” accessed November 20, 2019, <https://www.amnh.org/research/richard-gilder-graduate-school/academics-and-research/collections>.

⁴⁵ American Museum of Natural History, “About the Museum,” accessed November 20, 2019, <https://www.amnh.org/about>.

⁴⁶ American Museum of Natural History, “Museum History: A Timeline,” accessed November 20, 2019, <https://www.amnh.org/about/timeline-history>.; Victoria Cain, “Albert Bickmore,” *Harvard Magazine*, September-October 2008, accessed November 20, 2019, <https://harvardmagazine.com/2008/09/albert-bickmore>.

⁴⁷ American Museum of Natural History, “Museum History: A Timeline.”

maintains a permanent space within the museum itself, called the Discovery Room, that is dedicated to a young child's exploration of science.⁴⁸ The museum adapts experiences designed for children to better serve teenage visitors, providing regular hands-on classes and workshops at no charge to NYC teens. Students in grades 9-12 can also participate in one of the museum's five annual "After School" programs or the computer science-focused program "BridgeUP: STEM."⁴⁹ In addition to their educational offerings, the museum also runs a high school internship program and a research mentoring program, both of which provide paid experience and training to students from around the city.⁵⁰

Adult educational programming at AMNH also exists in a variety of forms. Similar to children and teens, adults can enroll in museum-taught classes and learn from scientific experts. For adults seeking formal, professional education in the sciences, AMNH runs two in-house graduate degree programs: the Richard Gilder Graduate School that grants doctoral degrees and a Master of Arts in Teaching program.⁵¹ For adults seeking less structure and more free-choice learning, the museum presents dozens of educational public programs in the forms of lectures, film screenings, and more each year.⁵² AMNH also presents educational programming targeted to educators themselves. Through the degree programs listed above, special educator-led events, and on-site professional development sessions, the museum brings hundreds of educators to the museum annually.⁵³

⁴⁸ American Museum of Natural History, "Children & Family Programs," accessed November 20, 2019, <https://www.amnh.org/learn-teach/children-and-families>.

⁴⁹ American Museum of Natural History, "Teen Programs," accessed November 20, 2019, <https://www.amnh.org/learn-teach/teens>.

⁵⁰ American Museum of Natural History, "Internships for Teens," accessed November 20, 2019, <https://www.amnh.org/learn-teach/teens/internships>.

⁵¹ American Museum of Natural History, "Graduate Degree Programs," accessed November 20, 2019, <https://www.amnh.org/learn-teach/higher-education/graduate-degree-programs>.

⁵² American Museum of Natural History, "Adult Programs," accessed November 20, 2019, <https://www.amnh.org/learn-teach/adults>.

⁵³ American Museum of Natural History, "Educator Programs," accessed November 20, 2019, <https://www.amnh.org/learn-teach/educators>.

Distance education is a different aspect of educational programming at AMNH. Now housed in its own sub-department within the education team, DE at AMNH found its beginnings back in 1880 when the museum designed illustrated lectures for teachers in NYC schools.⁵⁴ The development of digital DE resources happened in 1998 when the National Center for Science Literacy, Technology, and Education based at AMNH began searching for a “means of extending the museum’s presence beyond the physical walls of the museum.”⁵⁵ Each DE program at AMNH features the scholarly research and expertise of museum staff and is centered around major themes a visitor could find when exploring the museum in person. In contrast to an in-person visit, however, each resource has been created in such a way that the information stands alone, without the need for a visit to the museum. Therefore, the use of DE at AMNH is more about sending resources out into the world than necessarily bringing visitors into the building – an effort, I would argue, that embodies the true role of DE in meeting learners wherever they may be. The museum’s DE program now offers an assortment of online teacher professional development courses, curriculum packs, and interactive modules via the institution’s website. These programs have helped establish AMNH as an important resource in science education for audiences both near and far.

North Carolina Museum of Art

One of the many art museums that use DE to serve its audiences is the North Carolina Museum of Art. As the official art museum for the state of North Carolina, NCMA in Raleigh,

⁵⁴ Robert V. Steiner, Ashton Applewhite, Adriana E. Aquino, et al., “Online Teacher Professional Development from the American Museum of Natural History,” in *Teacher Learning in the Digital Age: Online Professional Development in STEM Education*, ed. Chris Dede, Arthur Eisenkraft, Kim Frumin, and Alex Hartley (Cambridge: Harvard Education Press, 2016), 88.

⁵⁵ Robert Steiner, PhD., interview by author, New York, January 28, 2020.

NC can trace its origins back to the creation of the North Carolina State Art Society in 1924.⁵⁶ As the founding body of the NCMA, the Art Society called for the creation of an art museum for the people of the state of North Carolina. After its formation, the society soon acquired enough funding and artwork donations to open a series of temporary exhibitions in downtown Raleigh in 1929. Approximately two decades later and in a then unheard of move, the NC state legislature appropriated \$1 million to purchase 139 pieces of American and European sculpture and painting.⁵⁷ Soon after, the Kress Foundation made its second largest donation on record by donating more than 70 works of art to the new collection and the NCMA was born.

The museum officially opened in 1956 under the direction of William Valentiner as the first museum in the U.S. to be created using state funds.⁵⁸ The NCMA quickly outgrew its original space in Raleigh's old State Highway Division Building, an issue that brought about a state legislature-led search for land on which to build the museum's permanent home. Despite some resistance, the new museum building opened in 1983 on the site of the former Polk Youth Prison on the western edge of the state's capital.⁵⁹ In 2000, two new projects began at the NCMA, including the construction of a new gallery building and a 164-acre museum park. Within the park complex are more than two miles of walking trails and more than a dozen large scale sculptures.⁶⁰

The museum's collection still finds its strengths in European and American art but has recently expanded to include major holdings of Egyptian funerary art, contemporary works from around the world, African and Oceanic art, and a large collection of Jewish art and ceremonial

⁵⁶ North Carolina Museum of Art, "History of the Museum," accessed February 8, 2020, <https://ncartmuseum.org/about/history/>; North Carolina Museum of Art, "Art Society," accessed February 8, 2020, https://ncartmuseum.org/art_society.

⁵⁷ North Carolina Museum of Art, "History of the Museum."

⁵⁸ North Carolina Museum of Art, "History of the Museum."

⁵⁹ North Carolina Museum of Art, "History of the Museum."

⁶⁰ North Carolina Museum of Art, "History of the Museum."

objects.⁶¹ NCMA also contains a library of more than 40,000 volumes which includes the personal collection of the original director.⁶² In addition, the museum offers art consultation services to people from across the state, through which members of the public can learn more about the history of their own artworks and how to best care for and display each piece.⁶³

Now under the direction of Valerie Hillings, formerly of the Solomon R. Guggenheim Museum and Foundation, the NCMA:

...serves the people of North Carolina and all visitors as a premier destination for compelling encounters with art. The NCMA is committed to exemplary scholarship and innovative educational enrichment. We invite interactions among diverse communities, foster collaborative partnerships, and seek to activate the creative potential in everyone. (NCMA, “History of the Museum.”)

Museum staff works to fulfill the mission of enriching the public through an assortment of on-site offerings. In addition to film screenings, outdoor concerts, dance performances, and seminars, the NCMA offers educational opportunities for every age group. Beginning with young audiences, the museum hosts routine programs for families with young children.⁶⁴ From family-friendly tours to day-long festivals to museum camps over school breaks, children can explore the museum, learn about art history, and create their own masterpieces. NCMA also offers activity packs for families unable to participate in the museum’s scheduled programs, including an indoor “Tour-in-a-Tote” and outdoor “Park Packs,” both of which are offered in English and Spanish.⁶⁵ The museum adapts its offerings for children to better fit its teen audiences, providing more intensive art-making workshops led by artists, writers, and more.

⁶¹ North Carolina Museum of Art, “Permanent Collection,” accessed February 8, 2020, <https://ncartmuseum.org/art/overview/>.

⁶² North Carolina Museum of Art, “Library,” accessed February 8, 2020, <https://ncartmuseum.org/art/library/>.

⁶³ North Carolina Museum of Art, “Art Consultation,” accessed February 8, 2020, https://ncartmuseum.org/art_consultation.

⁶⁴ North Carolina Museum of Art, “Families,” accessed February 8, 2020, https://ncartmuseum.org/programs_and_events/view/youth_families.

⁶⁵ North Carolina Museum of Art, “Families.”

NCMA also has a Teen Arts Council which brings together teens from across the state to learn about and participate in the behind-the-scenes work of the museum. The Council helps plan other teen programming on-site at NCMA, including an annual, themed teen night. Finally, as a collaboration between the Teen Arts Council and museum staff, NCMA also hosts an exhibition comprising works of art by teens from across the state.⁶⁶

College students and educators are two more target audiences for the NCMA. Similar to the teen art exhibition, college students can participate in a juried photography exhibition called “Park Pictures” that goes on display in the museum’s park complex. The museum also hosts an annual college night and 15 unpaid internships for undergraduate, graduate, and nontraditional students.⁶⁷ For educators, NCMA offers on-site professional development sessions in the form of gallery tours and workshops, helping educators improve their arts education skills. Teachers can also participate in the year-long NCMA Fellowship for Collaborative Teaching that offers hands-on guidance as teachers create standards-based units that integrate NCMA artworks into their classroom teaching.⁶⁸

NCMA began exploring the use of DE resources in 2010. After receiving a large grant to fill a hole in the museum’s programming for teens, NCMA started researching and developing a series of online courses for high school students.⁶⁹ After these courses were successful, the museum went on to develop virtual and virtual reality field trips for students of all grade levels. In many ways, NCMA began its foray into DE with the more challenging task of creating and implementing a set of statewide online courses while the rest of the field was thinking about

⁶⁶ North Carolina Museum of Art, “Teens,” accessed February 8, 2020, https://ncartmuseum.org/programs_and_events/view/teen.

⁶⁷ North Carolina Museum of Art, “College,” accessed February 8, 2020, https://ncartmuseum.org/programs_and_events/view/college.

⁶⁸ NCMA Learn, “Professional Development,” accessed February 8, 2020, <https://learn.ncartmuseum.org/programs/professional-development-for-teachers/>.

⁶⁹ Emily Kotecki, interview by author, New York, December 19, 2019.

virtual visits. The museum’s provision of courses to high school students established DE as a tool for museums to provide robust, long-term educational engagement comparable to a school class rather than solely a one-off experience such as a field trip.

The National World War II Museum

Much like its peers in the science and art world, the National WWII Museum also offers DE resources and opportunities. As the “official WWII museum of the United States,” the National WWII Museum in New Orleans, Louisiana is home to a leading collection of more than 9,000 oral histories and over 250,000 artifacts.⁷⁰ Under the direction of President and CEO, Stephen Watson, the museum “...tells the story of the American experience in *the war that changed the world*—why it was fought, how it was won, and what it means today—so that all generations will understand the price of freedom and be inspired by what they learn.”⁷¹ The museum found its conceptual beginnings in 1990 when two close friends and academics at the University of New Orleans, Stephen E. Ambrose and Gordon H. Mueller, PhDs, sought the creation of a museum dedicated to the second world war.⁷² After a decade of work, Ambrose and Mueller found success when the National D-Day Museum opened in June 2000.⁷³ Congress then designated the institution “America’s National WWII Museum” in 2004, bringing about the current name.⁷⁴ In the years since its opening, the museum has become part of a larger complex

⁷⁰ The National World War II Museum, “About Us,” accessed February 8, 2020, [https://www.nationalww2museum.org/about-us](https://www.nationalww2museum.org/about-us;); “From the Collection,” accessed February 8, 2020, <https://www.nationalww2museum.org/war/from-collection>.

⁷¹ The National World War II Museum, “Mission, Vision, Values,” accessed February 8, 2020, <https://www.nationalww2museum.org/about-us/mission-vision-values>.

⁷² The National World War II Museum, “Museum Founders,” accessed February 8, 2020, <https://www.nationalww2museum.org/about-us/our-team/museum-founders-stephen-ambrose-and-nick-mueller>.

⁷³ The National World War II Museum, “Museum Founders.”

⁷⁴ The National World War II Museum, “Museum Founders.”

that includes six museum buildings, a hotel and conference center, two restaurants, a courtyard, and a parking garage.⁷⁵

The NWWII Museum uses its various spaces to engage hundreds of thousands of visitors annually through a series of public programs. In addition to five distinct – and costly – museum tours, the museum offers a robust array of lectures, film screenings, and live period performances for audiences of all ages. The five expensive tour options feature opportunities to ride on a WWII-era boat, to explore the museum’s collection storage “vault” and to have a curator-led tour.⁷⁶ Because these options are only accessible to a privileged, limited audience, the museum’s public programs serve a broader audience. In terms of more traditional educational offerings, the NWWII Museum has special programs designed for families, K-12 audiences, and educators. Programs for these audiences include traditional field trips, National History Day, band and chorus performances at the museum, camps, and on-site professional development workshops.⁷⁷

Distance education at the NWWII Museum developed out of a dire need for a bigger audience. Following Hurricane Katrina in 2005 the NWWII Museum saw a drastic drop in the number of museum visitors and school groups.⁷⁸ Needing to improve these numbers while also dealing with the reality of New Orleans post-Katrina, the museum developed and began offering virtual field trips. The NWWII Museum continues to offer virtual field trips today, in addition to large-scale electronic field trips, curriculum packs, and Skype in the Classroom. The NWWII Museum, like its peers AMNH and NCMA, uses DE in these forms to engage audiences who cannot visit the museum in person. Grouping DE offerings from these three museums into my

⁷⁵ The National World War II Museum, “Campus Map,” accessed February 8, 2020, https://www.nationalww2museum.org/sites/default/files/2019-11/campus_map_nov_2019_0.pdf.

⁷⁶ The National World War II Museum, “Museum Tours,” accessed February 8, 2020, <https://www.nationalww2museum.org/visit/museum-tours>.

⁷⁷ The National World War II Museum, “School Programs,” accessed February 8, 2020, <https://www.nationalww2museum.org/students-teachers/school-programs>.

⁷⁸ Kate Fitzgerald, interview by author, New York, February 14, 2020.

categories of teacher resources, online courses and interactive modules, and alternative field trips, the following chapters will analyze how different formats of DE measure up to the needs of rural K-12 educators.

Chapter Two: Teacher Resources

This chapter examines the ways in which museums move beyond traditional on-site programs for teacher development and serve teachers across the U.S. using online professional development sessions and curriculum packs. After exploring examples in each category, the chapter concludes with an analysis of how each type of resource meets – or fails to meet – the needs expressed by an assortment of current rural K-12 educators.

Online Professional Development – AMNH

The American Museum of Natural History’s education department offers a diverse online teacher professional development environment. According to David Randle, PhD, Assistant Director of Curriculum and Instruction for Online Teacher Education Programs, and Robert Steiner, PhD, Director of Online Teacher Education Programs, AMNH offers professional resources in three digital formats. These include a blended online learning option via the learning management system Moodle, six MOOCs offered via Coursera, and the museum’s flagship program titled Seminars on Science (SoS).⁷⁹ MOOCs offered by AMNH resemble Coursera courses developed and presented by universities around the world: they can be taken for free, provide a certificate of completion for a flat fee, and are taught by the museum’s expert staff.⁸⁰

In contrast, AMNH’s SoS program is a deeper, more robust offering for current and aspiring educators. This program provides educators the opportunity to enroll in their choice of 12 six-week online courses covering topics ranging from “The Brain: Structure, Function, and Evolution” to “The Link Between Dinosaurs and Birds” to “Space, Time, and Motion.”⁸¹ Each

⁷⁹ David Randle, PhD, and Robert Steiner, PhD., interview by author, New York, January 28, 2020.

⁸⁰ Coursera, “American Museum of Natural History,” accessed February 10, 2020, <https://www.coursera.org/search?query=american%20museum%20of%20natural%20history>.

⁸¹ American Museum of Natural History, “Courses,” accessed October 28, 2019, <https://www.amnh.org/learn-teach/seminars-on-science/courses>.

course is presented asynchronously via a portal on AMNH’s website and is co-taught by an experienced educator and a leading AMNH scientist. To best fit into educator schedules, AMNH offers six course sessions a year, including two in the spring, two in the summer, and two in the fall.⁸² Each course has the same basic format, using textbook readings, images and videos, data sets, expert-authored essays, and case studies as instructional resources and assessing performance based on required assignments and discussion points. Each participant is also required to complete a final project, which according to Randle and Steiner is usually the creation and use of lesson plans or a curriculum unit on the course subject.⁸³

The SoS program at AMNH grew out of the museum’s 1998 initiative to “...help address the national crisis in science education..” and was first piloted in 2000.⁸⁴ The program’s model is based on the premise that the museum aims to teach educators online as though they were adult learners; as these “adult learner” teachers move through a course and gain comfort with engaging with real scientific data, the expectation is that the teachers will be able to successfully reproduce this type of teaching for their students. Since the pilot session, SoS has served more than 10,000 educators from all 50 states and around the world.⁸⁵ In its efforts to make professional development more accessible and useful to teachers, the museum has partnered with a number of other educational organizations through the SoS program. AMNH’s work with these partner organizations includes:

- International Baccalaureate: providing access to 70,000+ IB teachers internationally.

⁸² David Randle, PhD, and Robert Steiner, PhD., interview by author, New York, January 28, 2020.

⁸³ David Randle, PhD, and Robert Steiner, PhD., interview by author, New York, January 28, 2020.

⁸⁴ Robert V. Steiner, Ashton Applewhite, Adriana E. Aquino, et al., “Online Teacher Professional Development from the American Museum of Natural History,” 88.

⁸⁵ Eleanor Miele and Deborah Shanley, “Online Teacher Education: A Formal-Informal Partnership Between Brooklyn College and the American Museum of Natural History,” *The New Educator*, Vol 6 (2010), 253.; American Museum of Natural History, “About,” accessed October 28, 2019, <https://www.amnh.org/learn-teach/seminars-on-science/about>.

- National Science Teachers Association (NSTA): providing innovative, high-quality science instruction as one of the NSTA’s Learning Center Online Course Providers.⁸⁶
- Graduate School credit: educators can register to earn graduate credit from one of eight universities:
 - o Adams State University
 - o Bank Street College of Education
 - o City University of New York
 - o Framingham State University
 - o Hamline University
 - o Northwest Missouri State University
 - o Rutgers University
 - o Western Governors University⁸⁷
- New York State Department of Education: providing 45 Continuing Teacher and Leader Education (CTLE) credit hours to educators who successfully complete a course.⁸⁸

The SoS program also ensures that courses are taught in accordance with the Next Generation Science Standards, a set of content standards developed by various states to improve science education for K-12 students.⁸⁹

Online Professional Development – NWWII Museum

While the National World War II Museum does not currently offer online teacher professional development (PD) opportunities for K-12 educators, the museum has offered them

⁸⁶ American Museum of Natural History, “About.”

⁸⁷ American Museum of Natural History, “Grad Credit,” accessed October 28, 2019, <https://www.amnh.org/learn-teach/seminars-on-science/grad-credit>.

⁸⁸ American Museum of Natural History, “CTLE Credit,” accessed October 28, 2019, <https://www.amnh.org/learn-teach/seminars-on-science/grad-credit/ctle-credit>.

⁸⁹ Next Generation Science Standards, “Improving Science Education Through Three-Dimensional Learning,” accessed January 30, 2020, <https://www.nextgenscience.org>.

in the recent past. Hosted by museum educators and historical experts, the museum’s virtual PD sessions focused on topics relevant to WWII. Each session included historical background information, video footage from the war, artifact observation, and prepared lesson plans that teachers could bring directly to their classrooms.⁹⁰ Each live PD session was broadcasted using basic videoconferencing tools like Zoom, allowing an unlimited number of teachers to access and interact with the session at once. As the museum’s webpage states, all of the past sessions were designed for social studies teachers working with students in grades 7-12. In addition, the museum offered each session to teachers for free and shared the session overview and recording afterwards on the website.

The museum’s most recent virtual PD is still available online, both on the NWWII Museum website and the museum’s YouTube channel. This session, titled “Louisiana in World War II,” was taught by Joshua Goodman, PhD, the Teacher Programs & Curriculum Specialist at the time of the recording. A screengrab illustrating the session’s format can be seen in Figure 3. In addition to offering the recording of this virtual PD session, the museum’s YouTube channel also provides screen recordings of other educational webinars hosted by museum staff, such as the session represented in Figure 4. These recordings are not strictly professional development sessions, but they do offer similar content and operate within the same basic format as the museum’s virtual PD sessions. Included in the recordings shared post-hoc are student webinars, author sessions, and adult learner events. The museum also offers a Distance Learning Video Archive where teachers can explore the museum’s collection of videos from past PD programs.⁹¹

⁹⁰ The National World War II Museum, “Online Teacher Professional Development,” accessed January 15, 2020, <https://www.nationalww2museum.org/programs/online-teacher-professional-development>.

⁹¹ The National World War II Museum, “Distance Learning Video Archive,” accessed February 20, 2020, https://www.nationalww2museum.org/students-teachers/distance-learning/k-12-distance-learning/video-archive?field_video_category_target_id%5b73%5d=73



Figure 3

Source: The National World War II Museum, “Louisiana in World War II Teacher Professional Development Webinar” (video of live webinar, November 8, 2017), accessed January 15, 2020, <https://www.nationalww2museum.org/programs/online-teacher-professional-development>.



Figure 4

Source: The National World War II Museum, “WWII Innovation and Problem Solving Student Webinar” (video of live webinar, March 8, 2018), accessed January 15, 2020, <https://www.youtube.com/watch?v=5g0DbK4x7rQ&list=PLFTt9Iv9fryUXAoZhEjxOP1p25I8KrnIT>

Online PD for Rural K-12 Educators

The online teacher professional development programs offered at AMNH and the NWWII Museum present distinct but equally valuable models for serving K-12 educators. There are specific aspects of each model that relate to the program’s effectiveness for serving rural K-12 educators, including instructional approach, format, and cost.

- Instructional approach: AMNH approaches their online sessions through SoS as if they are teaching adults who happen to teach students, rather than teaching teachers. This distinction is outlined in the independent evaluation of the SoS program completed by Inverness Research Inc. As the Inverness evaluation states:

Unlike many courses designed for teachers, SOS courses are not about the teaching of science per se. That is, they do not focus on pedagogical theory. Rather, the courses are about science itself—the questions that working scientists ask, the ways they investigate questions, the knowledge that scientists have and that they gain, and the meaning of scientific ideas in society.⁹²

By focusing on teachers as learners themselves, the SoS program focuses its attention on helping teachers become comfortable with authentic scientific data and processes. The program also provides teachers with direct access to leaders in numerous scientific fields. Matt Heywood, an elementary school math and science teacher from Campbell-Savona Elementary School in the rural town of Savona, NY, states that accessing professionals and experiences of this quality is hard to find in rural communities.⁹³

In contrast, the NWWII Museum approached their online PD with the express purpose of sharing information with teachers for students. The goal of sharing teacher-focused material was to help make it easier for teachers to teach students about WWII. This

⁹² Inverness Research Inc. “Summary Results from the Independent Evaluation of the Seminars on Science,” accessed January 29, 2020, http://inverness-research.org/amnh-sos/evaluationsPDF/2007-03_AMNH-EVAL-Summary-2pgExecSum.pdf.

⁹³ Matt Heywood, interview by author, New York, February 25, 2020.

purpose is clear from the museum's inclusion of prepared lesson plans in the virtual webinars and the demonstration of how to teach with objects and documents from the museum's collection. In addition, the museum's focus on 7th-12th grade teachers filled a common hole in the field in terms of what grades museum resources typically serve. For the purposes of this research, I connected with Elayne Monjar, a high school history teacher from Lee County High School in the predominantly rural community of Sanford, NC, to ask her about her experiences using or not using DE resources in her classroom. She stated that one of the biggest challenges she faces when trying to find museum resources to fit into her classroom is finding prepared resources at the appropriate intellectual level for high school students. According to Ms. Monjar, "a lot of educational sources are aimed towards elementary school level so the academic level is not rigorous for my students. But on the other hand, museums tend to aim their resources for adult learners, which some of my high school students cannot understand yet."⁹⁴ For teachers like Ms. Monjar who work in rural communities, distance education can often be the only way to bring museum resources into the classroom. By providing grade-level appropriate instruction to high school teachers, the NWWII Museum is prepared to meet the needs of rural teachers like Ms. Monjar and make it more likely that museum resources actually get used.

- Format: AMNH provides their online professional development via an online course structure. Formatting the resource in this way provides participating teachers with a set period of exposure to course content and the network of instructors and fellow teachers participating in the course. The course lasts for a reasonable amount of time, with the six-week limit allowing for manageable time commitments and fitting comfortably into a

⁹⁴ Elayne Monjar, interview by author, North Carolina, January 15, 2020.

school's marking period, semester, or summer break. For rural teachers, there are often few educational institutions in the nearby vicinity that would allow teachers to take a course for this duration, and even most community college courses last for longer than six weeks. In addition, the asynchronous nature of AMNH's SoS courses means that teachers can fit the courses into their schedules as needed. While it is common for teachers at any school to fill more than one role, rural teachers are more frequently assigned additional duties due to the aforementioned challenges of finding enough qualified staff. As a result, formatting a six-week long course to be asynchronous greatly benefits rural teachers who may need more flexibility in when they can access professional development resources.

Starkly different than the format of the SoS program at AMNH, the NWWII Museum's programs presented alternate ways for teachers to access museum professional development resources. By presenting their PD in one-off, synchronous, and interactive webinars, the NWWII Museum gave teachers the opportunity to connect with the museum at a given time and for a defined duration. Whereas some teachers look for the longer-term course with assignments and projects like SoS, some need a single period of time in which they can connect with an expert and learn what resources exist and how to use them in their classroom. This is what the NWWII Museum's PD sessions did well. In addition, by posting screen recordings of their online PDs, the museum made the content available for a longer period of time as well as accessible for the teachers who were unable to participate in the live session.

- Cost: Due to the extensive nature of the SoS program, AMNH charges an enrollment fee of \$549 per course.⁹⁵ If educators wish to register for graduate or continuing education

⁹⁵ American Museum of Natural History, "Courses," accessed January 20, 2020, <https://www.amnh.org/learn-teach/seminars-on-science/courses>.

credit, there is an additional fee depending on which partner institution is selected. Partner institutions like the City University of New York (CUNY) or Hamline University charge an additional fee of \$861 and \$570 , respectively, while other partner institutions such as the Bank Street College of Education and Adams State University charge only \$240 and \$270, respectively.⁹⁶ While this may seem like a lot of money to pay for an online course, the cost is comparable to or lower than what an educator would pay to take a similar course online or in-person directly through a university. Some reports state that the average cost of an undergraduate credit hour via an online course can be anywhere from \$275-\$395. A graduate credit hour can cost \$100-\$125 more.⁹⁷ The SoS program offers not just one but three credit hours through their partner institutions. If an educator were to register for a SoS class and graduate credit from Adams State University, for instance, they would be charged \$819 as compared to the average cost of \$1,125 at a traditional university. In rural communities where teaching salaries are lower and the funding sources to subsidize teacher professional development are fewer, cost effective options like the SoS program are important.

In comparison, the NWWII Museum offered their online PD webinars for free. Interested teachers only needed to sign up for the webinar via an online registration form. While the type of content made available and the level of interaction between participating teachers in these webinars was different than the SoS program, the NWWII Museum's PD options were more financially accessible to teachers.

⁹⁶ American Museum of Natural History, "Grad Credit," accessed January 25, 2020, <https://www.amnh.org/learn-teach/seminars-on-science/grad-credit>.

⁹⁷ Learn.org, "What Is the Average Cost of Tuition Per Credit at an Online University?," accessed February 20, 2020, https://learn.org/articles/What_is_the_Average_Cost_of_Tuition_Per_Credit_Hour_for_an_Online_University.html.

Curriculum Packs

In addition to online professional development, museums also provide teacher resources in the form of curriculum packs. In the context of this paper, curriculum packs refer to prepared packets of museum content designed and formatted as curricula to be used in a classroom.

AMNH and the NWWII Museum both offer their own version of a curriculum pack.

Curriculum Collections – AMNH

AMNH shares curriculum packs online via the Learn & Teach section of the museum’s website. These curriculum packs, called Curriculum Collections, provide teachers with prepared materials to download and use in class.⁹⁸ Curriculum Collections cover a wide variety of topics including dinosaurs, earthquakes, and river ecology. When searching for resources on AMNH’s website, educators can select one of the available topics and will be taken to a subsequent web page listing all of the resources associated with said topic. Included on this page are lesson plans, articles and blog posts, videos, activities, and more. The dinosaur page, for example, includes in-class activities, articles, audio files of interviews with scientists, and coloring pages.⁹⁹ Samples of resources shared in the dinosaur curriculum pack can be seen below.

⁹⁸ American Museum of Natural History, “Curriculum Connections,” accessed November 20, 2019, <https://www.amnh.org/learn-teach/curriculum-collections>.

⁹⁹ American Museum of Natural History, “Dinosaurs: Activities and Lesson Plans,” accessed January 15, 2020, <https://www.amnh.org/learn-teach/curriculum-collections/dinosaurs-activities-and-lesson-plans>.

CREATE A TIMELINE OF THE EARTH

Our planet Earth formed about 4.5 billion years ago. That's a really, really long time ago! To help picture it, imagine the entire history of the Earth squeezed into just twelve hours, from noon to midnight. When we think of time in this way, humans have only been around for about a minute!



12:00 PM
4.5 billion years ago the Earth formed



11:23 PM
230 million years ago the first dinosaurs appeared



11:59 PM
150,000 years ago modern humans appeared

FUN FACT Dinosaurs did not all live during the same geologic period. *Stegosaurus* became extinct 66 million years before *Tyrannosaurus rex* walked the Earth.

To describe Earth's vast history, scientists use a geologic timescale. They divide it into long segments of time called eras. Each era is further divided into periods.

Earth events and organisms characterize each era and period. For example, the Mesozoic Era starts after an extinction event that wiped out almost 90% of species on Earth. Dinosaurs then flourished until the end of the Mesozoic Era, which is marked by another major extinction event. Most dinosaurs went extinct but one group of dinosaurs—birds—survived.

Working in a small team, you will create a poster presentation about one of the periods. You can use classroom and library resources, as well as the Internet to research the following information:

1. Landmasses
What did the surface of the Earth look like? Illustrate the arrangement of landmasses and/or continents.

2. Climate
What was the climate like? Was there an ice age? Was it very warm?

3. Earth Events
What major Earth events occurred during the period? Was there widely distributed volcanic activity, an asteroid impact, or the formation of large mountain belts?

4. Organisms
What plant and animal groups lived during the period? What organisms became extinct?

Tips

- As a part of your presentation, illustrate a 12-hour clock and mark the span of the period on the clock. Hint: Each hour corresponds to 375 million years.
- Include photographs of plant and animal fossils or artist renditions of organisms that lived during the period.

ERAS	PERIODS
Cenozoic	Quaternary 2 mya to present
	Tertiary 65-2 mya
	Cretaceous 145-65 mya
Mesozoic	Jurassic 200-145 mya
	Triassic 250-200 mya
	Paleozoic
Paleozoic	Carboniferous 360-300 mya
	Devonian 420-360 mya
	Silurian 445-420 mya
	Ordovician 490-445 mya
	Cambrian 540-490mya
Precambrian	Precambrian 4,500-540 mya

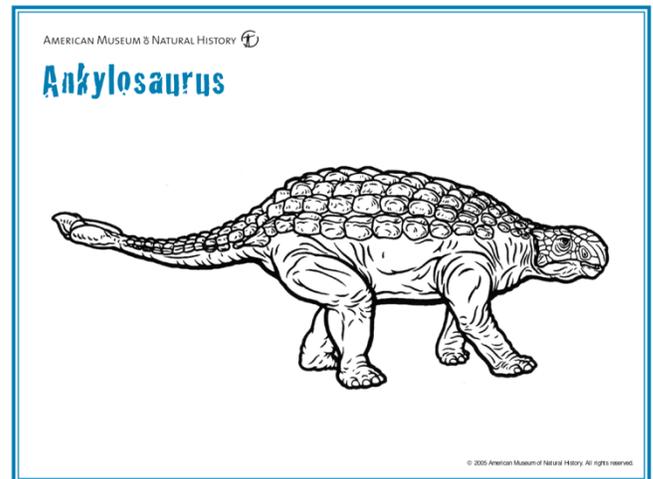


Figure 5 (left)

Source: American Museum of Natural History, “Create a Timeline of Earth,” accessed January 15, 2020, <https://www.amnh.org/learn-teach/curriculum-collections/dinosaurs-activities-and-lesson-plans/create-a-timeline-of-earth>.

Figure 6 (right)

Source: American Museum of Natural History, “Dinosaur Illustrations,” accessed January 15, 2020, <https://www.amnh.org/learn-teach/curriculum-collections/dinosaurs-activities-and-lesson-plans/dinosaur-illustrations>.

Classroom Resources – NWWII Museum

The NWWII Museum also offers curriculum packs similar to those offered by AMNH. The museum’s packs, referred to as Classroom Resources, are available for free download via the museum’s website and some are available for free in physical form via mail. The NWWII Museum has seven sections of classroom resources listed online, including resources focused on yearbooks from WWII, materials from traveling and special exhibitions, and multimedia

resources related to prominent themes from the war.¹⁰⁰ The section featuring yearbooks from WWII offers a short series of four prepared lesson plans that teachers can download and use in connection with digitized forms of real yearbooks from the 1930s and 40s.¹⁰¹ The traveling and special exhibitions section has resources from three recent exhibitions. When teachers visit the webpage for this section, they are able to download lesson plans, fact sheets, and class activity sheets in PDF form and access a recording of a related webinar. An example can be seen in Figure 7.

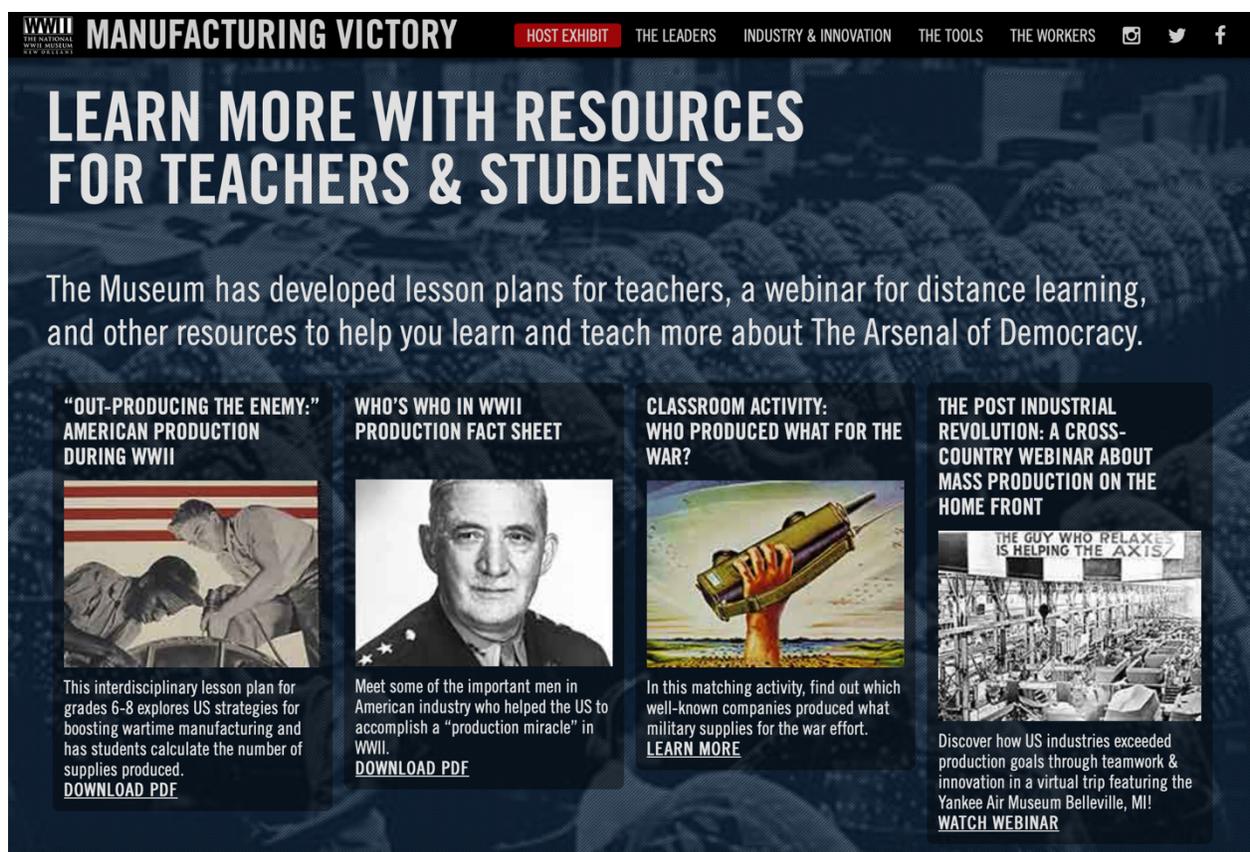


Figure 7

Source: The National World War II Museum, “Manufacturing Victory,” accessed December 20, 2019, <http://manufacturing-victory.org/history/education.php>.

¹⁰⁰ The National World War II Museum, “Classroom Resources,” accessed December 20, 2019, <https://www.nationalww2museum.org/students-teachers/educator-resources/classroom-resources>.

¹⁰¹ The National World War II Museum, “See You Next Year! High School Yearbooks from WWII,” accessed December 20, 2019, <http://www.ww2yearbooks.org/lesson-plans/>.

Finally, the section featuring multimedia resources related to prominent themes from the war is referred to as “From the Collection to the Classroom.”¹⁰² Unlike the other sections of the museum’s classroom resources, this section is account-based. Teachers can register for a free account on the museum’s new resource portal, ww2classroom.org. Once registered, teachers have access to curated essays, lesson plans, videos, and digital versions of documents and artifacts from the collection. These materials can be downloaded to a teacher’s computer or can be saved to their ww2classroom.org account for later use.

In addition, the NWWII Museum began sharing their classroom resources via an external education platform called Flipgrid in February 2020. As an emerging resource in the distance education field, Flipgrid allows teachers to share resources and engage with students online and encourage students to share their learning via self-recorded videos on assigned topics.¹⁰³ In an exciting move for the museum, the NWWII Museum became one of two museums listed as part of the platform’s Disco Library (the other was the Metropolitan Museum of Art). Flipgrid’s Disco Library is separate from any classes created by individual teachers and operates more as a collection of resources that any teacher on the platform can share with students. The NWWII Museum offers 25 “topics” via the Disco Library; each topic includes a video for students to watch, an additional resource such as an image or essay, and a prompt for students to respond to via their own video. An example can be seen in Figure 8.

¹⁰² The National World War II Museum, “From the Collection to the Classroom,” accessed December 20, 2019, <https://www.ww2classroom.org>.

¹⁰³ Flipgrid, “Flipgrid: Empower Every Voice,” accessed February 14, 2020, <https://info.flipgrid.com>.

The screenshot displays a Flipgrid interface. On the left is a video player with a play button, a progress bar at 0:00, and settings and full-screen icons. Below the video player is the title "Latinos in WWII" and a paragraph: "Men and women from many diverse backgrounds helped the American war effort during WWII, including an estimated 250,000-500,00 Latinos/as." Below this are two steps: "Step 1: Watch the video of Fred Maravilla and Rosemary Fagot sharing how they used their Spanish speaking skills while serving in the US Military during WWII." and "Step 2: Record a video explaining how speaking Spanish helped Fred and Rosemary during WWII, and if you could pick another language to speak, what would it be and why?". On the right side of the interface, there is a "Select a Grid" dropdown menu and an "Add" button. Below these are sections for "Topic created by" (National WWII Museum Educators), "Subject" (Social Studies / Social Sciences), "Audience" (Middle School (ages 11-13)), "Times used" (1), and "Engagement Ignited" (0 seconds). At the bottom right is an "Integration Notes" box containing text about a virtual field trip during Hispanic Heritage month.

Figure 8

Source: The National World War II Museum, “Latinos in WWII,” accessed February 15, 2020, https://admin.flipgrid.com/manage/discovery/13942?ns&playlist_id=17.

While the use of Flipgrid at the NWWII Museum is brand new, data on the Disco Library page shows that some topics have been used by more than 20 teachers and marked as a “fav” by more than 10.¹⁰⁴ Curriculum packs such as those highlighted in Figures 5-8 offer teachers a tidy package of content, a package that is both navigable and digestible without being overwhelming.

¹⁰⁴ Flipgrid, “National WWII Museum [25 Topics],” accessed February 15, 2020, https://admin.flipgrid.com/manage/discovery?ns=&playlist_id=17.

Rural K-12 Educators and Curriculum Packs

AMNH and the NWWII Museum offer similar approaches to sharing curriculum packs via their institutional websites. Both museums make their resources downloadable, the information is grouped thematically, and each theme includes resources in formats other than plain text files. Each of these characteristics is particularly important when it comes to engaging rural K-12 educators, as outlined in my interviews with educators.

- Downloadable: In an interview with Erica Tims, a high school English teacher from Campbell-Savona Jr./Sr. High School, the importance of downloadable resources was two-fold. According to Ms. Tims, rural teachers still need resources that can be used offline. As previously shared data describes, despite schools like Campbell-Savona having access to the internet and having a 1:1 student device plan, the internet is not always reliable. Internet signal, especially wireless signals used by student devices, can cut out unexpectedly, so web-based resources can become useless in those moments. In addition, student devices will often have technical issues or are forgotten by students, making any web-based activity impossible to do in class. Downloadable resources, however, can exist on the school's server or the teacher's desktop and be accessible in perpetuity. Ms. Tims also pointed out that downloadable resources are easier to adapt to the needs of a lesson. According to Ms. Tims, "that's a big thing – we don't just use them outright. We take them and adjust it how we want to teach [the subject]..."¹⁰⁵ While museums put immense effort into the planning and production of these resources, they cannot guarantee the chosen format will be the perfect fit for every teacher who chooses to utilize each resource. By making resources downloadable, pages can be removed,

¹⁰⁵ Erica Tims, interview by author, January 20, 2020, New York.

shortened, or excerpted to best serve the needs of the teacher and their class.

- Thematic groups: Angie Fishbaugh, an elementary school art teacher from Campbell-Savona Elementary School, discussed the importance of having resources easily accessible and thematically connected. Ms. Fishbaugh has yet to use distance education resources from a traditional museum but regularly utilizes lesson plans and curriculum packs from an online Elementary Visual Arts program. According to Ms. Fishbaugh, teachers can access a curriculum pack and find a thematically related resource section. She states that grouping resources according to themes makes teaching new topics more manageable for rural teachers - this type of organization makes resources fast and easy to find.
- Types of resources: The curriculum packs offered at both AMNH and the NWWII Museum present information in a variety of different formats. According to Ms. Monjar, these different formats make museum resources more appealing to rural students and teachers. For example, Ms. Monjar states that her students would “enjoy more interactive items” such as videos, games, or photographs instead of just “reading on the website about the information.”¹⁰⁶ Because many rural teachers are unable to take their students on field trips to see museum artifacts or resources in person, offering videos and other interactive materials online can more effectively engage audiences.

While there is not a single best format for online professional development and curriculum packs, the teacher resources provided at AMNH and the NWWII Museum highlight some of the aspects that make resources most effective for serving rural K-12 educators. As more museums look to develop these types of resources, both museums can serve as helpful examples.

¹⁰⁶ Elayne Monjar, interview by author, North Carolina, January 15, 2020.

Chapter Three: Interactive Modules and Online Courses

Another way in which museums seek to serve teachers through distance education is through the creation of interactive modules and online courses. Frequently more expensive than other forms of distance education, interactive modules and online courses are not as common in museums as online teacher professional development resources or curriculum packs. Two notable examples of these types of programs, however, can be found at the American Museum of Natural History and the North Carolina Museum of Art.

Interactive Modules – AMNH

AMNH offers a set of interactive modules in which educators are intended to lead students. One option is an interactive web-based lesson and activity called “Find a Vent” that explores hydrothermal vents located in the ocean.¹⁰⁷ Split into two sections, students can enter the “Library” to learn about what ocean vents are, how they are located, and what they mean for the ocean. Alternatively, students can choose to go on a virtual “Expedition” where they assume the role of a scientist to discover a virtual hydrothermal vent along the Juan de Fuca Ridge. Images of the main interfaces for each section of the interactive module can be seen in figures 9, 10, and 11.

¹⁰⁷ American Museum of Natural History, “Find a Vent,” accessed October 26, 2019, <https://www.amnh.org/education/resources/rfl/web/findavent/>.



Figure 9
 Source: American Museum of Natural History, “Find a Vent,” accessed October 26, 2019, <https://www.amnh.org/education/resources/rfl/web/findavent/>.

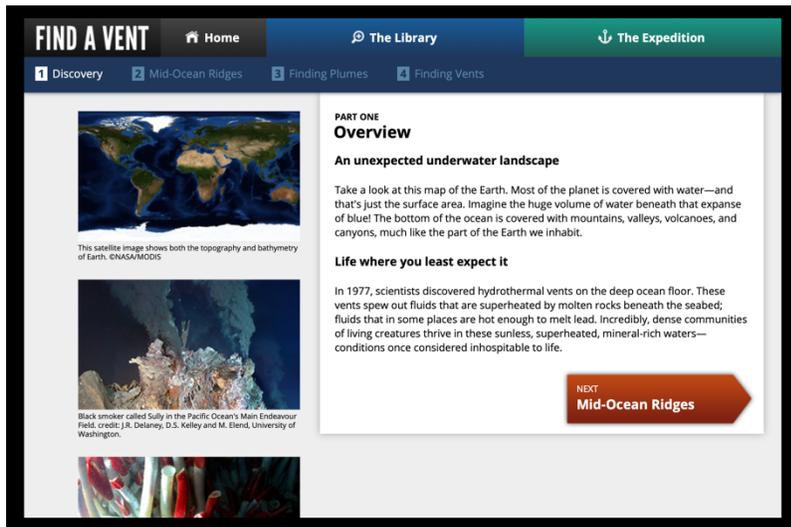


Figure 10
 Source: American Museum of Natural History, “Find a Vent: Library,” accessed October 26, 2019, <https://www.amnh.org/education/resources/rfl/web/findavent/#/library>.

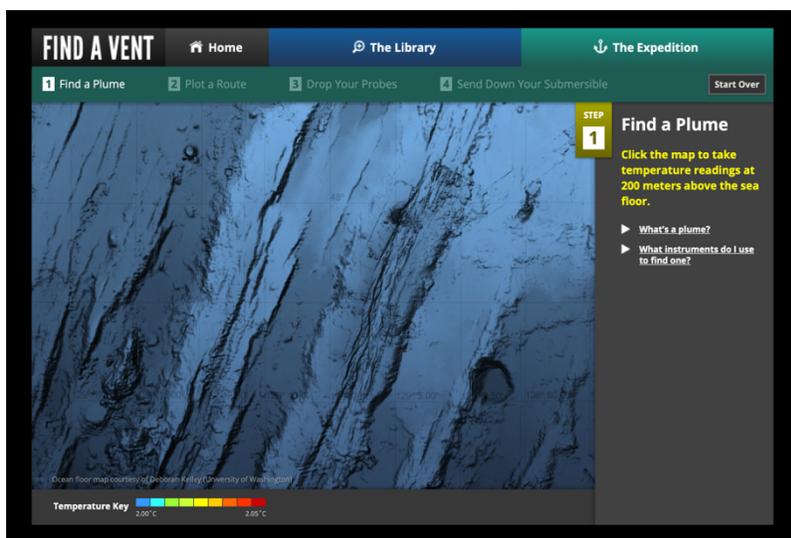


Figure 11
 Source: American Museum of Natural History, “Find a Vent: The Expedition,” accessed October 26, 2019, <https://www.amnh.org/education/resources/rfl/web/findavent/#/expedition>.

Another interactive module offered by AMNH is the OLogy portal. Designed to look like a separate, self-contained website, OLogy is housed within AMNH's broader museum website and can be found in the Learning Resources section of the Children and Family Programs page. Called "the museum's science website for kids," OLogy includes games, stories, hands-on activities, and videos for students to enjoy. In the game section are 63 educational games that cover a range of scientific concepts from anatomy to geography to anthropology and beyond.¹⁰⁸ Despite all being classified as the same type of activity – a game – this section of the portal includes a mix of games, quizzes, interactive infographics, and activities to be used in the classroom. Examples include:

- "Sounds of the Silk Road" where students can make their own music online¹⁰⁹
- "What do you know about Climate Change" quiz¹¹⁰
- "Talking to Fireflies" infographic where students click on a virtual pin on a map to reveal more data about the insect¹¹¹
- "Web of Life" activity.¹¹²

OLogy's story section operates as a library of content for students to explore. Similar to the games section, this section covers a wide variety of topics from space to genetics to the ancient city of Petra.¹¹³ Also included in the stories are topics shared with the games section such as the Silk Road and climate change, among others. The third section, hands-on activities,

¹⁰⁸ American Museum of Natural History, "OLogy: a Science Website for Kids," accessed October 15, 2019, <https://www.amnh.org/explore/ology>.

¹⁰⁹ American Museum of Natural History, "Sounds of the Silk Road," accessed November 20, 2019, <https://www.amnh.org/explore/ology/anthropology/sounds-of-the-silk-road2>.

¹¹⁰ American Museum of Natural History, "What do you know about climate change?," accessed November 20, 2019, <https://www.amnh.org/explore/ology/climate-change/what-do-you-know-about-climate-change2>.

¹¹¹ American Museum of Natural History, "Talking to Fireflies," accessed November 20, 2019, <https://www.amnh.org/explore/ology/zoology/talking-to-fireflies>.

¹¹² American Museum of Natural History, "Web of Life," accessed November 20, 2019, <https://www.amnh.org/explore/ology/biodiversity/web-of-life>.

¹¹³ American Museum of Natural History, "Stories," accessed October 15, 2019, <https://www.amnh.org/explore/ology/stories>.

provides activity supply lists, instructions, and educational material for students to do in class or at home. Activities shared online include making a model DNA structure, creating a field journal, and learning to read braille.¹¹⁴ Finally, the videos section hosts the smallest number of offerings out of all four OLogy categories. Included here are interviews with scientists that are split into two groups: Meet the OLogist and Ask a Scientist.¹¹⁵ Despite being the smallest, one of the best parts of this section is that it provides young students with the opportunity to hear directly from scientists and experts.

Online Courses – NCMA

NCMA began its foray into online distance education with the creation of museum-based online courses referred to as Teen Online Courses. Developed by educators from the NCMA and in collaboration with schoolteachers, the Teen Online Courses are hosted by the North Carolina Virtual Public School (NCVPS) system. NCVPS is a virtual school that allows more than 35,000 middle and high school students across North Carolina annually to take “online, blended, and mobile courses.”¹¹⁶ As the second-largest virtual school in the U.S., NCVPS offers more than 150 courses a year, including Advanced Placement credit, Occupational Course of Study (OCS) courses, and more. These courses offer a mix of synchronous and asynchronous engagement, audio- and video-based instruction, and alternative assessment tools.

NCMA’s partnership with NCVPS grew out of the work of Camille Tewell, the now Manager of Digital Learning. The museum currently offers four online courses: Art and Fashion,

¹¹⁴ American Museum of Natural History, “Hands-on,” accessed October 15, 2019, <https://www.amnh.org/explore/ology/hands-on>.

¹¹⁵ American Museum of Natural History, “Videos,” accessed October 15, 2019, <https://www.amnh.org/explore/ology/videos>.

¹¹⁶ NCVPS, “Director’s Welcome,” accessed January 30, 2020, <https://ncvps.org/directors-welcome/>.

Art of Game Design, Art of Digital Photography (for middle schoolers), and Art of Digital Photography (for high schoolers).¹¹⁷ Each of these courses was designed through a collaborative process involving museum experts, full-time teachers, and experts in a field relevant to each course (e.g. fashion designer or photographer). Students who wish to enroll in one of the museum's courses are able to do so for free and can register through their school's counseling office. Students who attend private schools or are homeschooled are also able to take the museum's courses through NCVPS with a few additional requirements. In spring 2020, I spoke with Michelle Harrell, the Director of School and Teacher Programs at NCMA, and she noted that the recent increase in platforms offering virtual courses for students in NC has coincided with a slight drop in course enrollment for NCMA.¹¹⁸ As the museum works on updating its courses, staff are also considering offering these courses via other virtual platforms. Tewell, who reviews each iteration of a course and makes minor edits as needed, stated that despite the drop in numbers the museum is still enrolling students from what she calls "critical county areas," many of which are rural.¹¹⁹

Serving Rural K-12 Educators – Interactive Modules + Online Courses

Interviews with rural K-12 educators reveal the challenges – and benefits – to incorporating interactive modules and online courses into rural classrooms. As discussed in chapter one, the biggest challenge with interactive modules and online courses for rural teachers is their reliance on web-based technology.¹²⁰ Interactive modules like AMNH's "Find a Vent" or

¹¹⁷ North Carolina Museum of Art, "Teen Online Courses," accessed October 25, 2019, <https://learn.ncartmuseum.org/programs/teen/teen-online-courses/>.

¹¹⁸ Michelle Harrell, interview by author, North Carolina, January 30, 2020.

¹¹⁹ Camille Tewell, interview by author, North Carolina, January 28, 2020.

¹²⁰ Erica Tims, interview by author, New York, January 20, 2020.

“OLogy for Kids” necessitate access to high speed internet. The same is true for NCMA’s online courses: without internet students cannot participate in the courses offered. Participating in online courses or completing an assignment with an interactive module becomes particularly challenging, if not impossible, for students who do not have internet access at home. As a result, these types of resources can end up being limited to classroom use only.

Despite this challenge, rural teachers also highlighted the benefits of interactive modules and online courses for their students. Ms. Monjar noted that the 90-day limit for her semester-long courses means she often has little room for including long activities or trips into her curriculum.¹²¹ Short modules similar to the ones offered at AMNH would allow Ms. Monjar to incorporate an interactive and instructional activity into her lesson plan without losing an entire class period. In speaking about the importance of museum resources to her rural students, Ms. Tims stated that museum resources expose students to and allow them to explore topics, materials, and concepts that are often inaccessible due to distance, cost, or a local lack of awareness.¹²² Online courses such as those offered by NCMA are an important part of this exposure by providing access to courses and content that a school may not have the resources to offer. As a result, museums such as NCMA and AMNH have the ability to supplement the education of rural students by providing interactive modules and online courses.

¹²¹ Elayne Monjar, interview by author, North Carolina, January 15, 2020.

¹²² Erica Tims, interview by author, New York, January 20, 2020.

Chapter Four: Alternative Field Trips

More and more museums are developing methods for bringing teachers and their students to the museum – without stepping foot inside the institution. Through virtual and electronic field trips and programs like Skype in the Classroom, museums across the U.S. are bringing teachers and students to their collections virtually.

Virtual Field Trips + Virtual Reality Field Trips – NCMA

Virtual Field Trips – Despite virtual field trips having existed at other museums before this, NCMA began offering free virtual field trips in public school teachers in 2015. Using the videoconferencing platform Zoom, a digital learning staff member leads each registered class through the museum’s galleries, visiting artworks relevant to the selected program.¹²³ With offerings for all grades K-12, teachers can choose from the museum’s current list of 19 programs including a few options relating to the most recent traveling exhibition.¹²⁴ Each program aligns with curriculum standards and includes pre- and post-visit activities. Program overview samples can be seen in Figure 12.

Grades 9-12

Perspectives: Understanding African-American Experiences through Art

How do artists represent African-American history and experiences? Students investigate two paintings depicting differing narratives of enslaved Africans in the pre-Civil War era and work collaboratively to make meaning from the paintings, examining a work of poetry in tandem to deepen their exploration.

Our State: NC Art and Artists

Learn about North Carolina by investigating works of art and artists with rich and diverse connections to the state.

Figure 12

Source: North Carolina Museum of Art, “Virtual Field Trips,” accessed December 10, 2019, <https://learn.ncartmuseum.org/vft/>.

¹²³ Camille Tewell, interview by author, North Carolina, January 28, 2020.

¹²⁴ North Carolina Museum of Art, “Virtual Field Trips,” accessed December 10, 2019, <https://learn.ncartmuseum.org/vft/>.

In addition to offering an online registration form via the museum’s website, NCMA also offers its virtual field trips via the Center for Interactive Learning and Collaboration (CILC) portal. CILC is a membership-based organization that provides education professionals with centralized access to alternative learning experiences.¹²⁵ By listing the museum’s virtual field trips on CILC, NCMA has made them accessible to an unlimited number of teachers.

Virtual Reality Field Trips – In addition to offering virtual field trips that take students through galleries in ways similar to a traditional field trip, NCMA also offers field trips using virtual reality (VR). As outlined by Emily Kotecki, a former NCMA staff member and current digital learning consultant, the recently developed virtual reality field trip program utilizes a 360 degree VR video of the museum’s conservation lab.¹²⁶ According to the program webpage, the VR field trips lets “...students hear from museum scientists about the techniques and tools they use to solve art mysteries.”¹²⁷ Despite their similar goals of providing students access to the museum and its resources, virtual field trips and the VR field trips at NCMA have two important differences. First, while the virtual field trips completed via Zoom provide synchronous access to the museum, the VR field trips do not. The content provided via the VR system is pre-prepared, meaning students engage with videos and quizzes that have been embedded into the experience by program designers. Second, the VR field trips are not entirely digital. While the “field trip” portion of the program is conducted using VR headsets, the current iteration of the program includes an NCMA educator who travels to schools across North Carolina to facilitate the

¹²⁵ Center for Interactive Learning and Collaboration, “How CILC Works,” accessed January 29, 2020, <https://www.cilc.org/How-CILC-Works>.

¹²⁶ Emily Kotecki, interview by author, New York, December 19, 2019.

¹²⁷ North Carolina Museum of Art, “Art + Science: A VR Field Trip for High Schoolers,” accessed December 20, 2019, <https://learn.ncartmuseum.org/programs/vrfieldtrip/>.

program. In addition to bringing the VR headsets with them, the educator brings “...resources to extend and diversify the experience, including an authentic object of ancient sculpture...” that students get to touch and explore in ways similar to a museum conservator.¹²⁸

Virtual Field Trips, Electronic Field Trips + Skype in the Classroom – NWWII Museum

Virtual Field Trips – Similar to the NCMA, the NWWII Museum offers synchronous virtual field trips to its audiences. While the museum offers these virtual trips to adult groups, groups of senior citizens, and school groups, the scope of this section will explore only the programs offered to K-12 school groups. As one of the first distance education projects at the museum, virtual field trips are a revenue-generating program for the distance learning department costing \$100 per session. The museum offers 11 topical programs:

- Los Veteranos: Latinos in WWII
- A Day of Infamy: The Japanese Attack on Pearl Harbor
- Iwo Jima and the War in the Pacific
- D-Day: The Turning Point of the War in Europe
- The Holocaust: One Teen’s Story of Persecution and Survival
- Don’t You Know There’s a War On?! The American Home Front
- Double Victory: African Americans in WWII
- The Warrior Tradition: American Indians in WWII
- It’s OUR War, Too! American Women in WWII
- I AM an American! Japanese American Internment in WWII

¹²⁸ North Carolina Museum of Art, “Art + Science: A VR Field Trip for High Schoolers.”

- The War That Changed Your World: Science & Technology in WWII¹²⁹

Each session is led by a museum educator from the distance learning team and lasts for a full class period. The museum educator leads the class through an analysis of selections from the museum’s vast oral history collection, as well as “maps, photographs, artifacts, posters, speeches, and songs as [students] explore the chronologies, strategies, motivations, and outcomes” relevant to the session’s topic.¹³⁰ According to the NWWII Museum’s Distance Learning Specialist, Kate Fitzgerald, the museum educator – currently Fitzgerald herself – takes on the role of the teacher for that class period. With each session led from the distance learning offices, both the class and Fitzgerald can see and hear each other, and Fitzgerald shares a PowerPoint presentation full of primary and secondary sources using Zoom’s screen sharing feature.¹³¹ Ten of the museum’s 11 virtual field trips follow this lecture and discussion format, while the last program involves students in a decision-making and critical thinking activity. This program, D-Day: The Turning Point of the War in Europe, allows students to “play the role of the generals who made the actual decisions on D-Day.”¹³² As generals, students analyze scenarios from the war, review the available options, make a decision, and defend their choice. Fitzgerald then helps students compare their decision with the one made on D-Day. To register for the D-Day program or one of the museum’s other virtual field trip programs, teachers can complete the sign-up form listed on the NWWII Museum’s website.

¹²⁹ The National World War II Museum, “Virtual Field Trips,” accessed December 10, 2019, <https://www.nationalww2museum.org/virtual-field-trips>.

¹³⁰ The National World War II Museum, “Virtual Field Trips.”

¹³¹ Kate Fitzgerald, interview by author, New York, February 14, 2020.

¹³² Kate Fitzgerald, interview by author, New York, February 14, 2020.

Electronic Field Trips – The NWWII Museum also offers electronic field trips. Unlike the museum’s virtual field trips, electronic field trips only go live once a year and are a mix of synchronous and asynchronous. Each electronic program is a “cross-country virtual expedition” to explore the sites, stories, and history of the selected theme.¹³³ The field trip features student reporters who have been sent to relevant historic sites around the U.S. and overseas to interview experts and then pairs this footage with important artifacts and exhibitions currently on view at the museum. The most recent electronic field trip, “The Manhattan Project,” aired in February 2020 and was accompanied by a 45-page classroom curriculum guide full of photographs, essays, and lesson plans. Now available for streaming on the museum’s YouTube channel, “The Manhattan Project” allows students to:

Join The National WWII Museum for a cross-country virtual expedition to discover the science, sites, and stories of the creation of the atomic bomb. Student reporters examine the revolutionary science of nuclear energy in the Museum’s exhibits and the race to produce an atomic weapon in complete secrecy. Explore the world’s first industrial nuclear reactor at the massive and remote Hanford Site in Washington State. Travel to the undercover laboratory and test site in New Mexico to learn about the team of talented physicists who tirelessly created the detonating device and witnessed its destructive power firsthand. Our reporters uncover the stories of mobilization, collaboration, and innovation to understand how the results brought about the end of World War II and forever changed the world. (The National World War II Museum, “The Manhattan Project: Electronic Field Trip”)

Figures 13 and 14 show a behind-the-scenes look at the production of the electronic field trip for 2020. These trips provide viewers with unique, first-hand access to historical sites and experts in a variety of fields, places that many students – and adults – will never have the opportunity to visit.

¹³³ The National World War II Museum, “The Manhattan Project: Electronic Field Trip,” accessed December 10, 2019, <https://www.nationalww2museum.org/students-teachers/distance-learning/k-12-distance-learning/electronic-field-trips/manhattan-project>.



Figures 13 (top) & 14 (bottom)

Source: The National World War II Museum, “The Manhattan Project: Electronic Field Trip.”

Skype in the Classroom – In addition to virtual and electronic field trips, the NWWII Museum offers a distance learning option called Skype in the Classroom. Hosted and supported by Microsoft, this program is free to any teacher registered with the Skype in the Classroom platform. The museum offers two programs via this platform, including “Dr. Seuss and WWII:

Analyzing Political Cartoons” and a “Mystery Skype” session. The Dr. Seuss program teaches students about political cartoons and the role of Dr. Seuss in WWII by showing examples of his creations. The NWWII Museum’s “Mystery Skype” option features a live stream with an educator located somewhere in the museum. Students ask questions to figure out where the educator is located, the type of museum, and the artifacts the educator is standing in front of, followed by a discussion about the history of the war.¹³⁴ Both of these options are shorter than the museum’s virtual field trips and electronic field trip offerings and are designed to supplement a classroom teacher’s instruction rather than replacing it for the day.

Alternative Field Trips for Rural K-12 Educators

The virtual field trips, virtual reality field trips, electronic field trips, and Skype in the Classroom programs offered by NCMA and the NWWII Museum present excellent options to serve rural K-12 educators. Albeit in different ways, each program addresses common challenges shared by rural educators during my interviews.

- Ease of access: According to Julie McLaughlin, a high school biology teacher from Campbell-Savona Jr./Sr. High School, and Mr. Heywood, finding time to search for a fitting DE experience can be the biggest obstacle to a rural teacher’s participation. The vast majority of museum websites and resources stand alone, meaning that teachers need to search the individual websites of multiple institutions in order to find the best option for their class. In recent years, however, more museums have started listing their DE experiences on sites that act as educational experience repositories. CILC and Skype in the Classroom are two examples of this type of repository. With the alternative field trip

¹³⁴ Microsoft Skype in the Classroom, “The National WWII Museum, New Orleans,” accessed February 5, 2020, <https://education.skype.com/pg/the-national-wwii-museum-new-orleans>.

options at both NCMA and the NWWII Museum listed on CILC, more teachers will be able to visit a single site and find many options. The same principle applies for Skype in the Classroom – teachers simply create an account on the Microsoft platform and are able to register for any available program.

- Technology: As discussed earlier, Ms. Tims, Ms. McLaughlin, and Mr. Heywood all mentioned the challenge of needing technology to access distance education resources. In addition to some rural schools not having internet access, many do not have access to high-end technology or the staff to support it. This means that many schools rely on basic hardware and software for their tech purposes unless purchases are grant funded. The lack of tech support staff – or even staff who are comfortable or experienced with emerging technology – presents a larger challenge to rural communities than the lack of devices, though. Without the privilege of having a person on staff who knows how to set up a videoconference session or program virtual reality headsets, rural schools are unable to connect to alternative field trip experiences.

Options like those presented at NCMA and the NWWII Museum, however, alleviate some of those concerns. Both museums use basic videoconferencing software like Zoom or Skype to host their programs, and the NWWII Museum also makes content from its electronic field trips available on YouTube after the live session. By operating the alternative trips on easy-to-access and easy-to-use software, both museums are making these trips more accessible to rural schools. For the VR field trips at NCMA, the museum has ensured that each VR headset being used for the program has the program material downloaded directly to the set, therefore access to the internet or another platform is not needed. In addition, NCMA has made great strides towards dealing with

issues arising when staff are not comfortable with the required tech. Camille Tewell hosts a session for teachers every Wednesday titled “All About Virtual Field Trips” where she helps teachers “...experience a portion of a virtual field trip, learn about the technology needed, and get tips for success.”¹³⁵ According to Ms. Tims, sometimes the best thing for a rural educator to have when trying to use DE resources is “an actual person to talk to.”¹³⁶ Tewell’s program does just that.

- **Cost:** As has been discussed in the previous chapters, the biggest deterrent to rural teachers taking students on field trips is the cost. When schools cannot afford to pay for field trips students are asked to pay for their participation, a process that excludes students from lower income settings. As Ms. McLaughlin explains, even in schools where “administration is supportive of [field trips], there is only so much money to go around.”¹³⁷ Alternative field trips at NCMA and the NWWII Museum, however, are free with the exclusion of the NWWII Museum’s virtual field trips. By offering programs free of charge, the museum makes the museum accessible to more schools and a wider audience. Even the \$100 fee for a virtual field trip at the NWWII Museum is lower than the cost of most traditional field trips and is thus more affordable for rural schools.
- **Engagement:** According to Mr. Heywood, one of the biggest challenges to using DE in a science classroom is how to make programs inquiry- and exploration-based instead of a lecture. While not every program offering discussed in this chapter fulfills this desire, the VR field trips at NCMA and the D-Day virtual field trip and “Mystery Skype” options at the NWWII Museum allow for more student engagement. Whether having students take

¹³⁵ North Carolina Museum of Art, “Virtual Field Trips.”; Camille Tewell, interview by author, North Carolina, January 28, 2020.

¹³⁶ Erica Tims, interview by author, New York, January 20, 2020.

¹³⁷ Julie McLaughlin, interview by author, New York, February 25, 2020.

on the role of a WWII general on D-Day, letting students explore a conservation lab via VR, or having students ask questions until they discover the program's setting, both museums have found ways to engage students through the screen.

Conclusion

As outlined in the preceding chapters, distance education has become a common practice in museum outreach and education. From asynchronous options like curriculum packs offered via museum websites and online courses to synchronous options like virtual field trips and live webinars for teacher professional development, museums continue to expand their DE offerings. The expansion of DE in museums has been touted in museum research and professional journals as an excellent resource for rural communities, an assertion that still holds true – with some important caveats. As my analysis of DE programs at the American Museum of Natural History, the North Carolina Museum of Art, and the National World War II Museum, guided by the needs and input of rural K-12 educators, illustrates, museums must pay attention to a few specific issues when designing and implementing DE resources. Among these specific issues are institutional motivations for having DE and understanding of available opportunities, affordability and sustainability of DE in the museum, and the role of DE in accessibility and equity within museum experiences and why these are important to the public-service mission of museums.

As a museum develops and implements DE resources, the institution should carefully consider two questions: *why* and *how*. Why does the museum want to start a DE program? Is it to receive a targeted funding stream or grant? To include more technology in the museum? To serve a specific audience? By examining the motivation for wanting DE resources, a museum will be able to start designing the most relevant services to meet their specific needs. In each of the case studies examined in this paper, the museum had clear motivations for developing its DE program. While a museum's motivation can often be something as general as expanding the walls of the museum, understanding *why* that expansion is happening can be crucial to a strategic

development of DE resources. Similarly, museums should ask themselves *how* they will create and run a DE program. How will the content be created: in-house or by consultants? How will materials be shared via the web? How will this new work be folded into the operations of the museum? How will museums adapt to challenges faced by audiences yet to be considered? How will the content be accessed by users? How will feedback be collected and applied? By thinking critically about how the creation and implementation of DE resources will happen, museums can make more appropriate and beneficial decisions.

These *why* and *how* discussions lead directly into the crucial discussion about affordability and sustainability of DE in a museum. This discussion is two-fold: how can museums make DE affordable and sustainable both for themselves and for the end users, specifically rural K-12 educators? Within the museum, developers should evaluate the options available for creating and hosting resources, including the software and hardware being used, the types of content to be included, and the location of digital DE resources within the broader digital existence of the museum. A DE resource created with quickly outdated code on an overly costly system and hidden too deep on the website is not helpful for anyone involved. When thinking about end users outside of the museum, particularly teachers from rural schools, it is important for institutions to be mindful of keeping programs free or at low cost. As rural schools struggle to find money for extra programs or field trips for students, a free resource may mean the difference between a teacher connecting with a museum or not. As Carro Eddings, a high school AVID and history teacher from Lee County High School in Sanford, NC, argues, there is nothing worse than discovering that the perfect resource costs too much money and is now out of reach. Museums should also work collaboratively to share and promote their DE resources. The more centrally located and interconnected these programs are with other educational offerings,

the more likely teachers are to learn about them and use museum DE. In light of the COVID-19 museum closures, the Museum Computer Network (MCN) compiled “The Ultimate Guide to Virtual Museum Resources, E-Learning, and Online Collections.”¹³⁸ The online arts and culture newsletter Hyperallergic also posted a list of 2,500 museums offering virtual visits.¹³⁹ Centralized lists and resource guides such as these are great tools to help make museum DE resources more accessible to teachers searching for opportunities.

In addition, museums should consider how sustainable DE projects will be in the context of the institution’s future. DE projects take time and money to develop and sustain. With many DE projects still grant-funded, it is not uncommon for there to be little to no money for DE-related staffing, support, or resource updates. The NCMA is an example of an institution that has thought carefully about the role of DE in the museum’s work: the Manager of Digital Learning position is now state-funded and will exist at the museum for the foreseeable future. According to Deborah Howes, President of the digital consulting firm Howes Studio Inc., the Metropolitan Museum of Art secured endowed funding for the museum’s Heilbrunn Timeline of Art History, a task that required the museum to shift how it thought about funding projects.¹⁴⁰ However complicated this may be with the current system of museum fundraising and finances, museums

¹³⁸ Museum Computer Network, “The Ultimate Guide to Virtual Museum Resources, E-Learning, and Online Collections,” March 14, 2020, accessed March 15, 2020, http://mcn.edu/a-guide-to-virtual-museum-resources/?utm_source=Current+MediaCombo+Newsletter&utm_campaign=810b2eafb9-EMAIL_CAMPAIGN_2019_12_08_11_17_COPY_01&utm_medium=email&utm_term=0_371e8236cb-810b2eafb9-590782401

¹³⁹ Hakim Bishara, “2,500 Museums You Can Now Visit Virtually,” March 16, 2020, accessed March 20, 2020, https://hyperallergic.com/547919/2500-virtual-museum-tours-google-arts-culture/?utm_medium=email&utm_campaign=D031720&utm_content=D031720+CID_bf5062c2dea283f0eb541b939d548a9f&utm_source=HyperallergicNewsletter&utm_term=2500%2520Museums%2520You%2520Can%2520ow%2520Visit%2520Virtually&utm_source=Current+MediaCombo+Newsletter&utm_campaign=810b2eafb9-EMAIL_CAMPAIGN_2019_12_08_11_17_COPY_01&utm_medium=email&utm_term=0_371e8236cb-810b2eafb9-590782401.

¹⁴⁰ Deborah Howes, interview by author, New York, January 31, 2020.; The Metropolitan Museum of Art, “Timeline of Art History,” accessed March 15, 2020, <https://www.metmuseum.org/toah/>.

can work to make DE resources more sustainable by including related expenses in general operating budgets or endowed funds.

Most importantly, museums must continue to evaluate and reevaluate how they are using DE as tools for access and equity in the ever-evolving museum landscape of the 21st century. Distance education as a tool for access and equity is particularly important when serving rural K-12 educators and their students. As Ms. Tims states, "...without these kinds of resources, these kids will never be exposed to [the museum]."¹⁴¹ In some ways museums still convey the belief that a DE-based visit to or engagement with the museum is a subpar experience or the second-best visit. For students and teachers from rural communities, however, a virtual field trip or an online teacher professional development course may be the best – and only – opportunity for the user to engage with that museum. DE resources, according to Mr. Heywood, provide "real-world experience," "allow students to interact with different people and different cultures," and "give kids the experience that they otherwise may not have been able to see or go to."¹⁴² By opening up that avenue for access and understanding the implications of accessing museum resources from rural communities, museums can serve as important actors in efforts to improve equitable educational experiences across school locales.

Finally, as the COVID-19 pandemic continues to alter the way that people live, work, and learn, the findings outlined here can be applied to broader discussions about the use of DE in serving other low-access communities. In light of the museum, business, and school closures happening across the U.S. in spring 2020, the need for alternate methods of connecting museum resources and audiences has become essential. This work is no longer about *if a person* cannot visit in person but rather *when all people* cannot visit in person, and museums must critically

¹⁴¹ Erica Tims, interview by author, New York, January 20, 2020.

¹⁴² Matt Heywood, interview by author, New York, February 25, 2020.

examine how best to serve the public remotely. By considering their motivations for creating DE resources in relation to the needs of the audience, how and why these resources will become a reality, and the role of DE in promoting equity and accessibility, museums can design engaging digital presences that effectively serve audiences and fulfill the mission of keeping the museum “open” to all.

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